AGRICULTURAL ENGINEERING

Published monthly by the American Society of Agricultural Engineers

Publication Office, Bridgman, Michigan. Editorial and Advertising Departments at the Headquarters of the Society, Saint Joseph, Michigan

Subscription price to non-members of the Society, $3.00 a year, 30 cents a copy; to members of the Society, $2.00 a year, 20 cents a copy. Postage to countries to which second-class rates are not applicable, $1.00 additional. Entered as second-class matter, October 8, 1925, at the post office at Bridgman, Michigan, under the Act of August 24, 1912. Additional entry at St. Joseph, Michigan. Acceptance for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 11, 1921. The title "Agricultural Engineering" is registered in the U. S. Patent Office.

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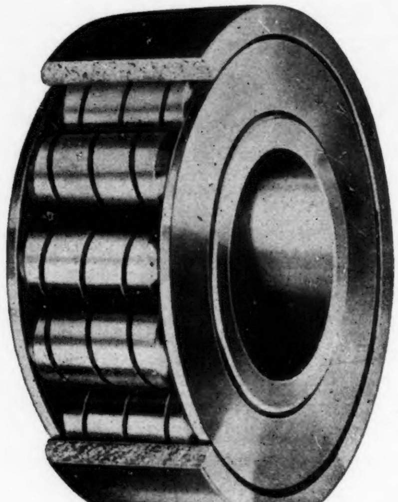

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AGRICULTURAL ENGINEERING

The Journal of Engineering as Applied to Agriculture

RAYMOND OLNEY, Editor

Vol. 7 JULY, 1926 No. 7

EDITORIALS

An Engineering Analysis of Agriculture Needed

ONE of agriculture's limitations is the lack of knowledge of vital factors by its own leaders. A short time ago I sat down with one of them and analyzed some of the lists of Mid-West agricultural leaders. In many instances the lists showed 80 per cent bankrupt, and composed of men who have little or no conception of the widely varying conditions in the agricultural industry.

They do not appreciate the wide range of conditions that must be taken into consideration to meet the conditions of the cotton grower of the South, the truck gardener of the East, the potato grower of Maine, the corn grower of the corn belt, the stockman of the plains, and the apple and orange growers of the Pacific Coast. Nor do they appreciate that in each type of farming on the same farm, there are problems that vary widely, many of which are covered by entirely different sets of laws. Nor do they know that the difference in the efficiency and cost of production between farms of the same class in the same locality varies as greatly. Nor do they have the slightest conception of any of the detailed operations, or the final cost of producing any of the crops in any field of agriculture.

Business men and investors generally are not only ignorant of such conditions but seem appalled when told that such conditions exist. Even our best bankers and insurance companies are pouring vast amounts of money into agriculture never dreaming that the basic fundamentals of the industry have never been worked out in anything like the detail that is common practice even in the poorest managed businesses.

I have recommended the calling of a general conference that will have for its object the working out of the fundamentals of agriculture and the making of a special study of the relation of agriculture to other businesses. My suggestion for a plan would be about as follows:

1. Have the American Society of Agricultural Engineers be responsible for an analysis of agriculture, to include breaking it up into its component parts.
2. Have an accountant of high repute make a preliminary accounting set-up that would give all of the data that, at the start, would seem to be valuable.
3. Use the U. S. Departments of Commerce, the Interior and Agriculture to collect such data and facts as seemed necessary to get data on best practices, rather than average practices, and at the same time make an effort to analyze and forecast not only crop conditions but market conditions as well.
4. Make each local bank or other local agency responsible for a complete report of at least one farm of each type having the farmer (who, of course, must be willing and anxious to cooperate) keep proper time and cost records, the local bank preferably being responsible for the actual bookkeeping.
5. Have these records carefully analyzed each year until the industry of agriculture was thoroughly understood. After a few years of such cost accounting and analyzing, banks and insurance companies could begin to require statements from all farmers who availed themselves of loans, thus making it possible to keep track of the conditions of the loan and at the same time give to agriculture a cost system.
6. To set up the machinrey to make a study of
   - (a) The small tract operated at high efficiency
   - (b) The dairy type of farm (say, 40 acres)
   - (c) The medium-sized farm of 160 to 200 acres, operated as a grain farm, as a stock farm, or as a combination
   - (d) The large grain type of farm.

   (In each case careful division between capital accounts and operating accounts should be made.)
7. To make a complete study of the sales methods in agriculture.
8. And such other things as may from time to time seem advisable.

I am of the opinion that farm operations will come under three types:

- (a) The small farm operated by the high type business farmer of the type that makes a success in a small business due to careful detailed work
- (b) The large farm operated by a man of much larger capacity than the average man of agriculture of today
- (c) A type of farming patterned after our holding companies where each farmer many be the owner of his own land, or perhaps a stockholder in the project. Or the farm may be owned by one party and operated by a tenant, the holding company to be responsible for general direction of the kind and amount of crop to be planted, and would direct sales and many operations now being inefficiently handled.

This last type of farming is on us now as there are many companies, such as our large insurance companies, that must either direct the farmers on a large scale or foreclose on an equally large scale. The business of the country cannot permit such a general disturbance as a general foreclosure.

I do not believe it is possible to put too much stress on the great need of an analysis of agriculture as an industry and the changed conditions that call for a knowledge of the new requirements if a profit factor is to be permanently introduced into the industry of agriculture. Furthermore, I would recommend that the engineers, who are men of analytical minds, take a part in analyzing agriculture similar to the part they have taken in analyzing the factory. It is the engineering mind that agriculture needs most of all today, and herein lies one of the greatest opportunities agricultural engineers have ever had.

ARTHUR HUNTINGTON

Electrification and Farm Prosperity*

THE unfortunate condition of agriculture in comparison with the exceptional prosperity of other industries in this country in recent years, has called forth many suggested remedies, among which are various bills now before Congress. Prosperity, however, cannot be obtained by legislation except as it may remove obstacles, and the seasonal character of agriculture and the fact that the farmer buys his supplies at prevailing high prices and sells his product in a competitive low market are facts that cannot be legislated away.

A more promising solution of the farmer's difficulties is suggested in an address by General Guy E. Tripp, at the recent convention of the National Electric Light Association. A similar solution was also given in an address by Glen Frank at the recent Madison regional meeting of the American Institute of Electrical Engineers. The remedy is the decentralizion of industry.

Electric superpower systems are vital to industrial decentralization. Without these systems ,industries will not spread out into the country, regardless of advantages to be secured by doing so, but will remain in congested centers. But where-

*An editorial from the June 1926 issue of the "Journal of the American Institute of Electrical Engineers."

ever superpower systems are well developed, power can be secured almost anywhere. Hence, as superpower systems grow, small factories will multiply in the rural districts.

Now, the chief obstacle to the electrification of our farms is the high cost of bringing electric service to them. It usually does not pay to tap a high-tension line and build a low-tension line to take care of the relatively small demand of a few scattered farms, but it frequently does pay to do these things to serve an industry; and when once a service connection is made and a line is built, neighboring farms can then be supplied with electric power at a reasonable cost. Hence, as small factories multiply in the rural districts, more and more farms will be electrified.

No one questions the great value of electric power to the farmer. Give the farmer electric power at a reasonable cost, and he can immediately relieve himself and his family of a large portion of their burden of labor, reduce his costs, make his profits more certain, and, what is of equal importance, raise his standard of living to a level corresponding to that of the city dweller, which will improve the morale of his family, help to keep his children at home and make it easier for him to secure effiecient labor when he needs it.

To sum up, the decentralization of industry will enable the farmer to broaden the earning capacity of his family, increase the business value of his farm and make his home more attractive. It appears, indeed, to be the most promising, if not the only practical influence that will bring agriculture back into step with other American industries and restore prosperity to it. If this can be done, it will mean the elimination of discontent and radicalism from a large and influential proportion of our population.

Farm Appraisals an Engineering Job

American Society of Agricultural Engineers
St. Joseph, Michigan

A SHORT time ago Mr. Olney, in one of the Secretary's Letters, suggested that members offer suggestions for subjects to be discussed and activities to be undertaken by the Society. Apparently the field I am in, appraisals and valuations principally of farm lands, has been given very little attention by the Society. In my opinion the problems of financing farms, either for the purpose of development or for more intensive operation, is a subject fully as important as the development or operation itself. Appraisals which are just both to the farmer and the lender require the skill and judgment of an experienced engineer, and this Society should be able to render a great service both to the farmer and the engineer who have entered this field by making a study of the subject. Some of the colleges have given land appraisals more or less attention, but such information as they may have gathered has been treated locally and perhaps in a little uncertain manner.

I should like nothing better than to see the federal farm loan system, the insurance companies and other agricultural lending organizations be able to avail themselves of good, scientific appraisal methods, and I beileve the A.S.A.E. can be the agency through which this research can be made.

I trust the above suggestion will be taken favorably and that in the future the Society will be able to do a great deal of good along this line.

F. H. SCHREINER

(Mem. A.S.A.E.) Appraisal Engineer
Bank of Commerce and Trust Co., Memphis, Tenn.

The A.S.A.E Program for 1926-27

By Oscar W. Sjogren

President, American Society of Agricultural Engineers

O. W. SJOGREN

IN OUTLINING a program for the Society one must be governed by the activities of the organization in the past. In looking back over the activities of the past years and the results accomplished one cannot but note the remarkable progress that has been made. It causes one to hesitate somewhat in outlining a plan of future action for fear that his plan will fall far short of its goal. There is an encouraging feature, however, to the work of the American Society of Agricultural Engineers, and that is the splendid support given to the officers by its members and the splendid cooperation evidenced in the work accomplished by the many important committees.

I shall not attempt to outline in detail the many lines of activity in which our Society should engage during the next year, but rather devote a few words to some of the features which are being pushed for greatly increased activity. One of these is the work of standardization. This one word might sum up the object of practically all committee work in all phases. I have in mind particularly at this time, however, standardization as applied to the farm operating equipment field. We all realize the need for standardization in all lines, and yet we realize the great benefits that has accrued from what standards work has already been done.

I firmly believe that, if our Society shows a willingness to undertake a greater program of standardization that it has been able to carry out in the past, we will receive full and unhampered support by the entire farm equipment manufacturing industry. In order to carry out a definite and constructive program of standardization it will require someone who can give his undivided attention to this phase of the Society's activity. It will be unjust to our efficient but already overworked secretary to ask that be give detailed supervision to this activity. It is perhaps too soon to begin to talk about an enlarged Society officer personnel after having taken the important step last year in employing our secretary on full time. When we realize that other engineering societies which are accomplishing noteworthy results in the work of standardization have not only a full-time standards manager but a rather sizeable working force and a considerable budget, we need not wonder at the results secured.

I do not want to depreciate the splendid results which we have secured in the past, but it is not just nor fair to expect a man to devote any appreciable amount of the time which is paid for by a commercial firm or a college to much additional work such as the standardization program calls for. Perhaps a plan can be worked out whereby we, as a Society, can secure the services of some man for part time to devote to this work, at least for a year or two. This work is of sufficient importance to warrant our putting forth strenuous effort to accomplish worthwhile results.

I hope that members of all committees which have any relation to standardization, and that takes in practically all, will give some thought to the above matter and be prepared to give expression to their thoughts.

There are many other activities which our Society must be prepared to continue and enlarge upon. I believe that our conception of research is beginning to shape itself so that we will see many more real projects outlined and put into action. That this be done is very important to the standardization work as its success must depend upon accurate information secured through research.

It is hoped that the work of the various technical divisions of the Society will not only continue as in the past, but that it will expand and grow in importance and accomplishments as the years go on. I hope that every member of the Society will be free in giving the officers their suggestions on any and all phases of the Society's activities.

What Federal Reclamation Should Include*

By Dr. Elwood Mead

Hon. Mem. A.S.A.E. Commissioner of Reclamation, U. S. Department of the Interior

CONGRESS at the present session has given marked attention to reclamation problems. Appropriations were made for seven new projects which will cost $60,000,000. Appropriations for thirty others were sought. Action on these had to be deferred because money in the reclamation fund was lacking.

The discussion of these measures in Congress showed that the nation recognizes that federal reclamation must continue in order that the western desert may be peopled and the nation's economic structure may be complete. It also showed that Congress recognizes reclamation is undergoing an evolution. That policies and methods are required to enable it to meet the demands of more costly development and the changes in rural life and habits.

The engineering achievements of the Bureau of Reclamation demonstrate it has had both the integrity and ability to carry out its complex and difficult task. In twenty-four years it has built over 16,000 miles of canals and ditches, constructed over 100 storage and diversion dams. These include the highest dam in the world at Arrowrock, Idaho. Other construction achievements are 106 tunnels, more than 1,000 miles of road, a dozen power plants, and 3,350 miles of telephone line.

More than 480,000 people live on the 37,000 farms irrigated by our federal works. The crops grown in 1925 were worth $77,608,880, an average of $62.45 an acre. Government storage works supplied water to private projects which grew crops worth $53,650,000, or a total addition to our national income of more than $131,000,000.

A competent critic makes the following summary of its achievements: "Massive dams; great artificial rivers diverted over the deserts; cities, churchs, schools, colleges, and farm homes built in what a generation ago was a desert. There are monuments to the vision and courage, which in the face of unforseen obstacles, has in a single generation written a new chapter in the history of the Nation and the West."

In its social and economic aspects the record of reclamation is not so satisfactory. Agricultural development on many projects has been slow. On some projects more than half the land is still unirrigated after ten years' operation. This delay in settlement has caused heavy financial loss to the government. The percentage of settlers who failed has been larger than it will be under carefully thought out settlement plans. Some had to give up and leave after the loss of several years' effort and the capital they brought with them. One aftermath of this is the large number of farms owned by banks and loan companies and cultivated by tenants. All who have visited the pioneer settler in his home, and have seen the economic waste in leaving him to struggle without aid and direction in the unproductive work of clearing the land and preparing the surface for irrigation, are convinced that much of this hardship and loss could have been averted if the same skill and abaility had been enlisted to direct the settlement and development of farms that has been shown in the design and construction of canals.

At the outset it was expected that the government would be able to build large works in difficult locations as cheaply as the pioneer irrigator built his smaller works in favorable locations, and that settlers would be able to pay for these works in ten years. Experience showed that the hope of cheap construction could not be realized. Higher costs led to the time of payment being extended to twenty years, and now in 1926 still higher construction costs have caused the time of payment to be extended to a maximum of forty years.

A longer time of payment on government projects will help the settler after his farm is ready for cultivation because no interest on construction cost is charged. Under government canals the settler has only to make a yearly payment of 2½ per cent of the cost. If he keeps this up forty years he owns the works. Under private enterprise, he must pay at least 6 per cent interest in addition to payments on the principal. The yearly payments on private projects are therefore about four times those required under government reclamation. It looks therefore as though this country will follow Egypt, India, Australia, and Africa in making reclamation a function of the government. The benefits which come from homemaking, from increased taxable wealth have justified reclamation as a national policy in other countries and will lead to its expansion in ours.

The success of federal reclamation requires more than generous terms of payment for irrigation works. Before there can be any payment there must be settlers; before the settler can pay anything he must have his land ready for irrigation and be equipped to cultivate it as irrigation requires.

The paramount need of reclamation, therefore, is a settlement and farm development program, one which will attract to and hold on these projects people who love the soil and

*Address before the 20th annual meeting of the American Society of Agricultural Engineers, at Lake Tahoe, California, June, 1926.

The success of federal reclamation requires more than generous terms of payment for irrigation works. Before there can be any payment there must be settlers; before the settler can pay anything he must have his land ready for irrigation and be equipped to cultivate it as irrigation requires. The paramount need of reclamation, therefore, is a settlement and farm development program, one which will attract to and hold on these projects people who love the soil and have a pride in their calling. The careless, negligent farmer has no place on an irrigation project. Aid and expert advice in farm development should be made a part of our reclamation policy.

have a pride in their calling. The careless, negligent farmer has no place on an irrigation project. How then are settlers of the right type to be attracted and given a fair chance to succeed? This is not our problem alone but that of all countries that have land to reclaim.

Settlement here has added significance because this is no longer a country of pioneers. The movement is away from farms instead of toward them. The higher wages and shorter hours of city industries attract farm-born boys and girls. Homeseekers will no longer make a start in tents or sod houses. Privation and hardship are not required under our easier conditions of life in cities. Industry, thrift, skill, and knack in farming are indispensable but they will avail little unless the settler has a house to shelter his family, his land properly leveled for irrigation, and the farm made a going concern.

Helping the settler take these preparatory steps has not, heretofore, been a part of our reclamation program, and we are not agreed as to what it should include. In this we are a quarter of a century behind other countries. The reclamation planning of India, Australia, South Africa, and other countries starts with the farm and the kind of agriculture needed to pay project costs. Australian states advance from $3,000 to $10,000 for clearing and leveling the land and to complete the improvement of a farm. All reclamation countries except the United States make aid and expert advice in farm development as much a part of their reclamation policy as aid in canal building. A recent letter from an irrigation authority in Canada voices this view: "Our irrigation problems in Alberta are not so much engineering and construction as they are settlement, operation, and maintenance."

The conventional of the Oregon Irrigation Congress in 1925 was devoted mainly to a discussion of how to settle irrigation projects. One of the most constructive papers* contained the following statement:

1. "Oregon has found that settlement of land is not an automatic achievement. It never is with the right kind of settlers."
2. "Oregon must take some arrangement for settling her lands for which water is available."
3. "For the next five years at least, Oregon's irrigation work is one of settlement, not creation of new districts."
4. "Oregon can make her irrigation district credit one hundred cents on the dollar by keeping her irrigation management out of politics and formulating a definite land settlement and land development policy, the same as she has of her state highways and harbors."

The projects for which Congress this winter made appropriations will provide water to irrigate 350,000 acres at an average cost of about $120 an acre. This land is now unleveled, uncleared sagebrush. Aside from the canal, everything needed to convert these deserts into farms remains to be done. Careful studies by experts familiar with local conditions fix the cost of changing 40 to 80 acres from sagebrush into a farm at from $5,000 to $10,000. That money must be spent before the settler can earn a living or make payments for water. If we are to build these works we should have plans for getting the settler, and having him, other plans for helping him get started. We realize that preparing land for irrigation is not farming; that, on the contrary, it is an engineering operation. The implements used are not needed in farming and cost more than the beginning farmer can afford to pay.

To leave this work to the unaided uncoordinated efforts of beginners wastes the time and a large part of the settler's meager capital. Not all men can level land. It requires a peculiar knack to do it well and cheaply. Poorly prepared fields reduce the value of crops. Preparing land for irrigation is therefore a part of construction and ought to be so regarded. Every argument in favor of government aid in building canals supports aid from some source in levelling the land.

If farms were made ready for cultivation, more and better farmers would desire to settle on new projects. They could begin farming by doing the things they understand. They would be on an earning status almost at the outset. Now they have to risk their time and money in doing work of which they know nothing. This certainly is wasteful and foolish. Private enterprise is learning this. One recent example is at Montague, California, where Dr. G. W. Dwinnell, a leader in reclamation planning, mortgaged the land for money with which to make farms ready for settlers. He leveled the land, seeded part to alfalfa, and hired a few good carpenters to build houses and barns. He did this at far less outlay than settlers who would have had to work at a disadvantage. He furnished money to buy carload lots of grade Holstein cows which were sold to settlers on time payments.

The plan sold the farms. Settlers could start with an income in sight which is a wonderful aid to courage and confidence. The scheme has been a financial success. Not a single settler has failed and Dr. Dwinnell has not had to worry over unsold land or delinquent payments.

At Los Molinos, California, unimproved farms were sold to settlers without any inquiry as to their capital or plan as to what they were to do. Long before development was completed, their money was gone and they faced disaster. It happened that Frank Vanderlip was a stockholder in the project. He went down in his pocket for a quarter of a million dollars; loaned it to these settlers, and by so doing saved their homes. Without help at this time, Los Molinos would have been a social tragedy. Credit made it one the most properous colonies in northern California.

Los Molinos is a near neighbor to Durham, one of the two California state land settlements. At Durham the money used in preparing the land for irrigation and seeding it to alfalfa was obtained from the federal land bank. Settlers have 34½ years in which to repay this cost. Payments are amortized. A yearly payments of 6½ per cent keeps up interest and pays off the debt. If these settlers had had to pay 8 per cent interest on money borrowed to prepare their land for alfalfa, or pay off the loan in ten years, nine out of ten would have failed. If they had been left to level and seed the land without aid or direction, Durham would have been a fiasco. As it is, it has an international reputation as an exmple of success in rural planning, and in showing how poor men can be helped to become farm owners.

Wisconsin has cooperated with private colonies in securing funds to build houses, clear land for settlers for the cutover areas of that state. Mr. Hugh MacRae of Wilmington, North Carolina, has blazed a trail in scientific land settlement that is well worthy of study by all students of the problem of how to attract and hold people on the land. The basis of his system is to have development work completed before the settler comes on the land. The farm as a going concern is sold on long-time payments and the settler is given expert advice regarding his crop program.

Recently representatives of three private reclamation projects requested the U. S. Bureau of Reclamation to take them over. The canals are completed, the settlers are on the land. But they have no money with which to prepare the land for cultivation, and without this they can not earn a living. The settlers are as helpless as if they were stranded on a desert. It will not do to lend this money to the settlers to be spent without oversight, any more than it would be safe to lend them money to build a canal without supervision. What is needed is an advance of money to develop the farms under expert direction, as a service rather than a loan. But it had to be explained to these private project representatives that this service is not now given on government projects.

In Australia, the settler on irrigated blocks is required to have a capital of $1,500, and the state supplements that with advances up to $2,500 for the improvement of the land and for building permanent improvements. South Africa has the same system. Canada makes advances to settlers of $1,000 to $4,000. Denmark once sold improved farms to settlers who could pay one-tenth of the cost of the farm and improvements in cash. Now a payment of 25 per cent in cash is required. In all of these credit schemes the time for repayment of money spent on permanent improvements is long, varying from twenty to seventy years.

Selection of settlers on federal reclamation projects became a national policy for the first time this year. Under regulation of the Secretary of the Interior, settlers are required to have at least two years' experience and a minimum capital of $2,000 in money or equipment. This amount will

*"Credit and Its Influence on Irrigation Development," by J. D. Neale.

"The pressing problem of federal reclamation is settlement and farm development," says Dr. Elwood Mead. "We have now neither an established plan nor money for doing these things in an orderly, comprehensive way." In presenting this situation to the American Society of Agricultural Engineers at its twentieth annual meeting, Dr. Mead felt that he was getting it before "an organization fitted by training and experience to help solve a problem worthy of the attention of our ablest minds."

not improve and equip a farm, but to require more would be to exclude a majority of the thrifty, industrious families who seek homes on the land. Since this selective plan went into effect there have been twice as many applicants with less than $1,000 as with $2,000, and there has not been a single applicant with $10,000.

What we need therefore is a plan which will require the settler to have enough capital of his own to underwrite and make secure advances to complete the development of his farm and then some fund from which these advances can be made. It should not be made by a bank but by some organization that will oversee its wise and economic expenditure. That means advances similiar to those provided by Dr. Dwinnell, Mr. Vanderlip and the government systems of other countries.

Thus far we have only considered plans for reclaiming public land. This alone will not answer. Two-thirds of all the land of future federal projects will be privately owned. The homestead and grazing homestead acts have enabled people, many of whom are not farmers and never expect to become farmers, to acquire the land located in possible reclamation projects and they have done this.

The situation this creates is illustrated on the Owyhee project. Out of 89,000 acres of unleveled, unimproved, unoccupied sagebrush land 70,000 are privately owned. Nearly all has been acquired through grazing and homestead filings. Probably not 5 per cent of these owners have money enough to clear the land. It is well suited to orchards, sugar beets, and dairying. It ought to be subdivided into small farms. Forty acres would be a good unit. From four to eight times as many farmers will be needed as there are now landowners. The problem is how are we to get these widely scattered people to work together in the subdivision settlement and development of the land, so that the water can be used when the canals are completed.

We have put an end to speculation by a law which compels owners to sell at an appraised price fixed by the government. That appraisal has been made but it needs to be supplemented by a constructive plan for coordinated action by landowners that will put these units into the hands of some agency that will select the right type of settlers, help them get started under conditions that will enable them to stay, and succeed. It is encouraging to know that one of these landowners proposes to follow here the plan he has successfully followed in Canada, which is to clear and level the land, subdivide it into small farms, build houses and make these farms going concerns. So far as known, he is the only owner with the capital and vision required to carry out this program.

The Owyhee project has great opportunities and advantages but more than a canal is needed to create the homes its resources make possible. Unless we provide the aid settlers will need, this project may have the slow development of the Belle Fourche project. The last-named project has good land, plenty of water, is admirably suited in climate and location to the growing of sugar beets and alfalfa, and combining with these dairying and lamb fattening. These things are only done, however, by good farmers, and unfortunately many of the first settlers on this project were miners, city clerks, deep-sea divers, itinerant baseball players—a collection of heterogeneous occupations as far removed from good farmers as could be conceived. As a result, at the end of fifteen years, there are seventy empty houses and a large number of fertile but abandoned farms. Much of this land is now owned by mortgaged and trust companies who for a long time hoped that buyers would come and agricultural development automatically take place.

Now all the people interested are taking hold of settlement, the railroads, the state and the Bureau of Reclamation are cooperating with the non-resident landowners to work out a reclamation program. If 160 good farmers could be added to those already on this project it would be one of the most attractive and prosperous in the country.

The same is true of the Lower Yellowstone project where after ten years of operation only one-fourth of the land is irrigated. One hundred good farmers on the idle land of this project, cultivating small irrigated tracts, making dairying, alfalfa, and sugar beets the basis of this agriculture, would insure the return of the government's investment and make this one of the most successful of northern irrigation projects.

During the last two years Congress has given much attention to settlement. The conditions on some of the older projects, the economic surveys of those proposed have shown its importance. Legislation has been deferred by difference of opinion as to what authority should furnish the money and management for settlement and farm development. Three means of accomplishing the desired result have been discussed. One is that the state should do this on the theory that they have a vital interest in the quality of the settlers and in the prosperity of the project. It is urged that local knowledge and experience would be invaluable in directing this important part of reclamation. Under this theory the Bureau of Reclamation would be mainly a construction agency. When it had built the works, the state would take charge, select the settlers, work out the crop program, and furnish the money needed to supplement the settlers' capital in improving farms.

This theory has encountered a fatal obstacle in Congress. Not a single member of Congress from the arid states favored it and all of the arid states were opposed mainly because of a belief that it would be impossible for the states to raise the necessary money.

Another plan for financing and directing this work is to take the money from the reclamation fund, thus increasing the money spent on the project and the payments of the settlers to the government. The opposition to this is vigorous, the support lukewarm.

The third plan is that the locality where a new project exists should raise a fund which shall be used to supplement the settlers' capital, in making the farms ready for cultivation, the expenditure to be supervised by a representative of the fund. This fund could be made a revolving one, as loans from the federal land bank could be secured, after the farm has been sufficiently improved to make it produce an income. (The federal land band will not lend on unimproved land. It must be assured that there is a crop income sufficient to meet the payments.) Such a plan could not operate on all projects. Some are in sections of the country where the people are all poor and where nearly everyone is already a borrower.

As in Canada and on many private irrigation enterprises, the pressing problem of federal reclamation is settlement and farm development. We have now neither an established plan nor money for doing these things in an orderly, comprehensive way. I present this situation to an organization fitted by training and experience to help solve a problem worthy the attention of our ablest minds.

A New Machine to Combat the Grape Leaf Hopper

By J. P. Fairbank

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THERE may be "nothing new under the sun," but a machine is working in the sunny Imperial Valley which is unusual at least. A small tractor of popular make is no longer novel, and power-driven machines to dust chemicals on plants to control insects have been in use for years. Tents are as old as the history of man. But it is not customary to see two long tents travelling through a vineyard, humming a tune we have learned to associate with small tractor engines and leaving behind a trail of fog.

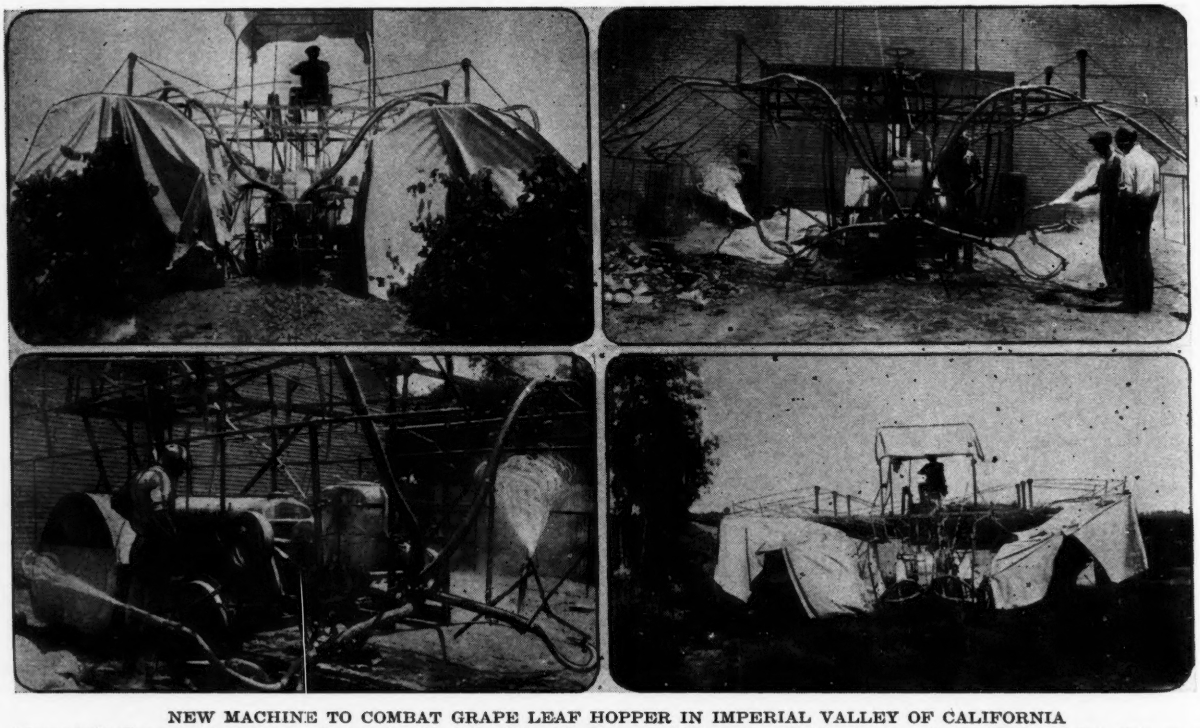
Cautiously approaching the monster it is seen that each tent is astride a vine row and that these vines are being dusted with calcium cyanide blown in and through four nozzles placed to direct the dust upward, downward and sidewise. The dust is carried by air blasts through flexible metal tubes which come from a standard make of dusting machine.

The whole outfit is carried on framework built upon a tractor. This tractor not only carries the assembly but drives the duster through belts. The operator sits up above the "works," extensions being provided for him to control the machine. By raising the outer half of the two wings of the tent above the vines it is possible to turn the whole outfit in the same radius as a tractor alone.

The purpose of the device is to kill the grape leaf hopper, an insect which is a menace to grapes in some sections. For several years members of the college of agriculture of the University of California have been working with growers in determining methods of combating the leaf hopper. About two years ago Prof. H. J. Quayle, who is located at the Riverside Citrus Experiment Station, and E. L. Garthwaite, who was then farm advisor of Imperial County, made a study of methods of controlling this pest. They recommended that insecticide be applied under tents to control the fumes better. Then the problem was to devise a practicable method of moving the tents. Wiley M. Weaver of El Centro, who manages the vineyards of W. L. Hodges, and who also appreciates the labor-saving possibilities of power-driven machinery, set out to move the tents and apply the dust in a continuous operation. He is still experimenting, but this year he has built and is operating the machine illustrated in the accompanying pictures.

The "tents" are eighteen feet long arranged with flaps at either end which closely surround the vines. The tractor travels at a rate such that each vine is under the fume-filled tent for about eight seconds. Mr. Weaver is now trying to determine the time and amount of dust required to kill all the hoppers. He is using from fifteen to thirty pounds of calcium cyanide to the acre.

Naturally an experimental device causes delays, but nevertheless his operator dusts an average of about twenty-five acres a day, and under favorable conditions can do four acres an hour. The percentage of "kill" has been considered very satisfactory so far but Mr. Weaver and field men for the chemical manufacturers hope to reduce the amount of cyanide to about fifteen pounds. He has taken out basic patents on this method of dusting, not only for grapes but for all crops. With minor changes in the framework he hopes to make the tents adaptable to field crops and to rows of various widths. If this invention proves as effective as Mr. Weaver and many growers in the Imperial Valley expect, it is another example of the value of applying engineering to agriculture.



NEW MACHINE TO COMBAT GRAPE LEAF HOPPER IN IMPERIAL VALLEY OF CALIFORNIA
(Upper left) The grape leaf hopper duster, developed by Wiley M. Weaver of El Centro, California, in action. (Upper right) This view shows the nozzle arrangement of the Weaver duster. (Lower left) This illustrates the method of mounting and driving the dusting machine. (Lower right) This view shows the tents lifted for turning

Some Observations on the All-Steel Barn

By Frank P. Cartwright

Engineer, National Lumber Manufacturers Association

THE account of the Cole all-steel barn appearing in the May issue of AGRICULTURAL ENGINEERING is of considerable interest and should be particularly gratifying to agriculturalists in that it illustrates the initiative and progressiveness of the up-to-date farmer. Mr. Cole is much to be congratulated on his conception of a permanent, completely fireproof barn, consrtucted for greater convenience in interior handling of hay, grain or other produce. It is to be regretted that he did not take into his confidence some authority of fire-resistive construction, or some one from the engineering staff of his state agricultural college or the Bureau of Public Roads, U. S. Department of Agriculture, who could have helped him in realizing that conception. He would have found, first, that his ideal could not be completely realized by use of the material which he evidently chose and, second, that the advantages which he did realize from the material in question are obtainable at less cost with more familiar materials and methods.

Fire Resistance. No building is completely fireproof though some approximate this ideal very closely. To be most nearly "fire-resistive," as insurance underwriters, building code authorities and engineers prefer to term it, buildings must not only consist of incombustible materials but must also be able to withstand the heat of a fire without material damage and to prevent its spread from one part or story of the structure to another. To draw a familiar parallel, a coal stove is a completely fire-resistive structure. It nevertheless may have an exceedingly hot fire in it; and so may a barn. A barn, in fact, from the nature of the materials customarily stored in it, is subject to hotter and longer fires than almost any type of factory or residence building, and to be fire-resistive to an extent permitting re-use after a fire has occurred, must be of more than usually high grade construction. The only type of structure which at present meets this situation is one of reinforced concrete or structural steel, the reinforcement rods or structural shapes of which are covered to a depth of not less than two and one-half or three inches with concrete or heavy masonry material. Even such a building will require some repairs after the usual hot fire before it can safely be re-used. The expense of this type of construction is at present well out of the reach of all except "gentleman farmers."

Mr. Cole's barn of structural steel obviously will not withstand successfully a fire of any duration. Unprotected steel, though it will not burn, loses practically all its strength at relatively lower temperatures than those obtaining in the ordinary fire. In fact it will not keep its strength and shape and support its load as long as a wooden beam or post designed for the same load. When fire tests were made at the Underwriters' Laboratories in Chicago recently to show the relative dependability of structural steel and other types of columns at ordinary fire temperatures, it was found that unprotected structural steel gave way in ten minutes, whereas unprotected wooden columns designed for the same loads gave way in about twenty-five minutes. The reason is easily apparent. The steel became heated through at once and lost its strength, though it did not burn. The wood, while it readily took fire, did not lose its strength because of heat and only failed when the timber had been burned through. It is quite conceivable therefore that a farm building with an unprotected structural steel frame would become a twisted, tangled wreck within a few minutes after a fire had started, while a wooden-framed structure might well stand up long enough to permit extinguishment of the fire with apparatus called to the spot by telephone.

Where a barn is exposed to burning brands carried by the wind, its resistance to fire will depend first, on whether the pitch of the roof will permit such brands to remain on the surface and second, on the character of the roofing or exterior surface material. There is no question but that sheet steel will not ignite under such circumstances. On the other hand, hay or other combustible material, exceedingly dry and fine in character, such as may collect or be placed against the interior surface of a barn roof, will be readily ignited by the transmitted heat of a burning brand on the outside. Data published by the American Society of Heating and Ventilating Engineers show that sheet iron will transmit over two and one-half times as much heat as an inch board, and there is grave danger that such exposure would ignite combustible material resting against the opposite surface of the roof covering. By far the best method of securing fire-resistance against brands is to have a sharply pitched roof, or failing that, a wooden roof or one of low heat conducting capacity surfaced with a strictly non-combustible roofing material. This does not mean any type of composition shingles, roll roofing or slate surfaced roofing, for these are made largely of felt and asphalt—both highly combustible. Experiments at the U. S. Bureau of Standards have shown that roofing materials, to oppose effective resistance to large brands, must be of asbestos, cement, burned clay, or other similar materials. As regards the sides of the structure, flying brands obviously will not come to rest on them and both steel and wood are equally effective against such exposure.

Where a barn is likely to be exposed directly to flame and heated gases from the burning of a nearby structure, and where no facilities for fire fighting are available, there is little to choose between wood and steel. The former will ignite and burn readily; the latter will transmit heat almost immediately to ignite the combustible contents within. Where fire-fighting equipment is available or can be brought to the spot within a reasonable length of time, the wooden surface is undoubtedly the best. It does not readily transmit heat to the interior of the structure and while it will ignite, the flame can be fought readily and effectively from without. Steel, on the other hand, transmits heat readily to the material within, and this when ignited is extremely difficult of access for fire-fighting purposes.

Summarizing the foregoing, it is apparent that very little in the way of added fire resistance results from the increased expenditure for the all-steel barn and that, from most viewpoints, it is less desirable that the well designed wooden structure.

Durability. Wood unpainted and exposed to the weather decays in time. Certain species decay more rapidly than others and if the less resistant kinds of lumber are taken as a criterion, wooden construction is probably not much superior to that of sheet steel. There are available, however, plenty of data by which farm builders may be guided in selecting weather resistant wood, and most farmers have sufficient experience themselves to avoid unsuitable species. They are less likely to realize the difference between iron and steel, or between soft steel and high-carbon steel, and the difference in rate of corrosion of these materials is very important. Competitive advertising accords steel a maximum life of only 15 years, as against twice that for iron pipe. High carbon steel is affected by the elements even more rapidly. Galvanizing delays corrosion for at least three years, but steel siding should be thoroughly painted not more than five years after it is applied, if it is to be at all permanent. Furthermore, it must be painted both inside and out. Steel transmits heat so readily that there is more or less daily condensation or dew on the interior as well as the exterior of the structure, and rust attacks it as readily on the inside as without. The cost of painting is doubled, and it cannot be put off. Good years and bad, busy season or otherwise, steel must be painted. If neglected, it will become honeycombed in a short time and no amount of painting will then help to save it. Wood, on the other hand, can be neglected for several years without much damage, and repainting effectually checks the weathering process. There are few farmers,

for that matter, who cannot recall a dozen wooden farm buildings which have stood for thirty, forty and even more years, guiltless of paint, and which still offer unbroken resistance to the weather.

Neither steel nor wood should be used where it will be more or less continuously damp, for neither will last long under such circumstances. Where such use is necessary, however, wood has available a method of protection not open to steel. Wood can be treated against decay by filling its pores with creosote or other preserving material and when thus protected far outlasts either steel or unprotected wood in damp locations. Treated timbers are but little more expensive than untreated timbers, and are now readily bought on the market. Farmers should insist that their local lumber retailers carry such material and should use it for all exposed purposes. Treated railways ties last two to four times as long as those not treated.

Freedom from Interior Posts and Beams. For a barn to be used entirely for storage of hay or grain an uninterrupted interior space is of course desirable. Whether its desirability justifies strenuous efforts to attain it is questionable. The writer has seen many well arranged barns where occasional "bents" of timbers extending across the interior facilitated horse-fork arrangements and helped in mowing away, separately, different kinds of hay or grain, and he has seldom heard complaint of such arrangements.

Whether or not the absence of posts is a consideration, it is possible to eliminate them in a wooden-framed barn just as easily as with steel. The Division of Agricultural Engineering, Bureau of Public Roads, U. S. Dept. of Agriculture, has for free distribution complete plans for a barn, 36 feet by 60 feet in plan, no part of the framing of which projects more than two feet from the walls, whereas the trusses of the all-steel barn project into the interior from four to six feet. (Mr. Cole's barn was 36-by-72 feet in plan, but the government plan can be extended to any length desired.)

No farmer who has a postage stamp need to be concerned about this aspect of barn construction, for the government plans provide for use of not more than two-inch lumber throughout, and can be followed easily by any carpenter who can read blue prints.

Cost. The report of the all-steel barn states that the steel framework cost $3,980 delivered but not erected, and that the completed cost, including the foundations and stable was between $5,000 and $5,500. The cost, f.o.b. job, of light structural shapes, fabricated as these were, runs about $200 per ton, and we may assume that there were about 20 tons of steel framing used for the barn. During and since the war steel erection has cost not less than $50 per ton and there is no reason to suppose than it cost much less in this case. This would add another thousand to the cost of the framework in place. The cost of 22-gage galvanized, corrugated siding erected in place is certainly not less than $15.00 per square. The barn in question, to judge from the illustrations, would require about ninty squares of siding; adding at least $1,350 to the cost of the structure or a total of $6,350. We are asked to believe that foundations, reinforced concrete drive floor, and stables were installed for less than nothing.

About 13,000 feet, board measure, of framing lumber are required for the 30-by-60-foot barn, built according to the government plans mentioned above, and this would be increased about ten per cent for a similar structure 72 feet in length. The total of 14,300 feet, board measure, would then cost slightly over $700 figured at $50 per thousand. It is customary for such buildings to allow 100 per cent additional to cost of the material for carpentry. This would mean a total cost for the timber frame in place of slightly over $1400 as against a cost of about $4,000 for the steel frame delivered and an estimated sum of $5,000 for the steel frame erected. 13,200 b.m. of inch lumber of various types is needed for sheathing, siding and roof boards of the government planned barn. Adding 10 per cent to this for a fair comparison with the all-steel structure, we have about 15,800 square feet, b.m., of such material, including a 15 per cent allowance for waste, which at current prices of lumber and labor would cost $950 delivered and $1900 erected, making a total of about $3300, as against not less than $6,000 cost of framing and siding for the steel structure. We do not know what local building materials dealer estimated the cost of duplicating Mr. Cole's barn in conventional timber construction but are much inclined to doubt that the materials for a similar structure of wood would cost more than the steel barn erected under price and labor conditions usually obtaining.

Comfort. Reference has been made to the probability of condensation on the interiors of sheet iron structures, as causing corrosion. It is also an important factor in the comfort of stock or the preservation of stored farm products. Because of the presence of animals, or of hay or grain not completely dried out, the air within a closed barn is almost always warmer and more humid than that without. When this warm, moist air comes in contact with the cold sheet steel it promptly deposits a part of its moisture in the form of dew, which drips and trickles down upon the occupants and contents of the building. The results of such wetting may be disastrous to stock, and the condition is never desirable.

The freedom with which heat escapes through steel has another disadvantage, in that steel buildings are harder to heat. Most farmers depend on the animal heat given off by stock to keep the temperature in barn stables within bearable ilmits. In lambing time, however, or when products easily damaged by frost are stored, heating appliances are often installed. It is about twice as hard to keep a steel structure at the desired temperature as it is to heat one sided with wood, and the bodily heat of animals will hardly suffice for their comfort in the former case.

In offering the foregoing remarks on the relative merits of all-steel and wooden barn construction the writer has attempted to avoid bias which might naturally attach to his remarks as a representative of a lumber manufacturing organization, and to discuss the various consideraitons which should govern choice of materials for farm buildings from the viewpoint of those who must from time to time choose between such materials.

Because of its availability wood has been the farmers' construction material for generations. Progress undoubtedly will influence the use of other materials where more suitable for special purposes or where their economic advantages are obvious.

Welding Nickel-Chromium Alloys

By A. H. Hoffman

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THE agricultural engineer may often have to use electrical heating devices or make up resistance units for controlling electric currents. Nickel-chromium alloys have been found very satisfactory as a resistance material for the heating elements because these alloys will stand up at red heat in air for long periods of time. One drawback has been the extreme difficulty that has been experienced in making permanent and satisfactorily strong connections to such wires and in repairing breaks that may occur. The usual connection has been a compression device of some sort which in some cases worked loose due to repeated temperature changes. The usual resort when a break occurred has been to put in an entire new heating unit even when the wires had not deteriorated from long use.

Charles E. Barbee of the agricultural engineering division, college of agriculture, University of California, has found that very satisfactory bonds can be made using the oxy-acetylene torch. The oxide coat is first scraped from the surfaces of the alloy wires or rods. If the wires are not too small better results are obtained by using cast iron filler rod and the usual flux for cast iron. For very small wires that give trouble by gettitng too hot, brazing is often more satisfactory and can be accomplished with little difficulty using the oxy-torch and ordinary brazing flux. Clean surfaces at the start are essential to success.

Research in Agricultural Engineering

A department conducted by the Research Committee of the the American Society of Agricultural Engineers

The Engineer and the Soil---An Orientation for Reclamation

By R. W. Trullinger

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AGRICULTURAL products come either directly or indirectly from the soil. The agricultural engineer, in the proper performance of his duties, should therefore be familiar with the influence which the soil exerts on the satisfactory functioning of production factors. Such knowledge, to be the most useful, should provide a basis for the development of mechanical methods and equipment, necessary in production, which will economically meet the soil conditions imposed.

The agricultural engineer dealing with that phase of reclamation relating to the regulation of soil moisture, whether in irrigation, drainage, or dry farming practices, is obviously confronted with an important soil problem. Considerable information is available relating to the principles of engineering hydraulics which are applicable to drainage and irrigation structures so long as the soil is not specifically considered, or is at best considered only empirically. Relatively little information is available relating to the principles governing the action of water in and through soil, which has been so interpreted as to provide a sound basis for the design of drainage or irrigation systems and structures.

It is a singular and striking fact, however, that an extensive record of investigational work on soil moisture and the factors governing its functions is available. The greater part of this work has been conducted primarily from the agronomic viewpoint, and is therefore in somewhat abstract form from the viewpoint of the agricultural engineer. An interpretation or a further development from the engineering viewpoint of some of the more or less abstract principles relating to soil moisture, already established, seems necessary therefore in order to provide the reclamation agricultural engineer with a sound basis for his operations.

Soil Moisture and Crop Growth. Crops are known to require rather definite individual quantities of moisture, properly distributed, to permit their optimum growth and maturity, and considerable data are available for different important crops in this connection. Crops also require a normalcy of other growth conditions such as temperature, air supply, nutrient supply, etc., which may be unfavorably affected by the presence of an excess or the occurrence of a deficiency of moisture in the soil. These principles seem to hold quite generally, regardless of the nature of the soil itself.

Where conditions of external moisture supply are obnormal, artificial measures must frequently be resorted to, in addition to the customary soil management practices, which will prevent the occurrence of either a deficiency or an excess of moisture in the soil, with their accompanying unfavorable influences, and at the same time enable the soil to provide the necessary moisture to crops. The necessity for irrigation or drainage, or both, is usually thus developed, the nature and intensity of which will depend upon the individual requirement of the crop for moisture, and upon the peculiar set of conditions presented by the soil and the management practices in use. Quite naturally the normalcy of the growth factors other than moisture must not be seriously disturbed by these artificial measures.

Irrigation and Drainage and the Soil. Perhaps the most important problems with which the agricultural engineer must deal in the design of an irrigation or drainage system or a combination thereof are those relating to the specific influence of the soil on what he desires to accomplish. A recognition of some of the apparently more or less superficial aspects of such problems has resulted in a large amount of empirical testing of the so-called duty of water of different crops on various soils and in empirical investigations of run-off, to provide a basis for engineering design. It seems to have been overlooked in a great many instances that the proper regulation of soil moisture by artificial measures is not necessarily confined to the regulation of total soil moisture. Total soil moisture is not necessarily available soil moisture when the individual requirements of crops are concerned. This is complicated by the fact that soils under normal conditions are known to vary quite widely in their ability to retain and supply the necessary amount of moisture to crops in available form, and to permit other growth factors to also remain normal. The situation therefore becomes even more difficult under abnormal conditions.

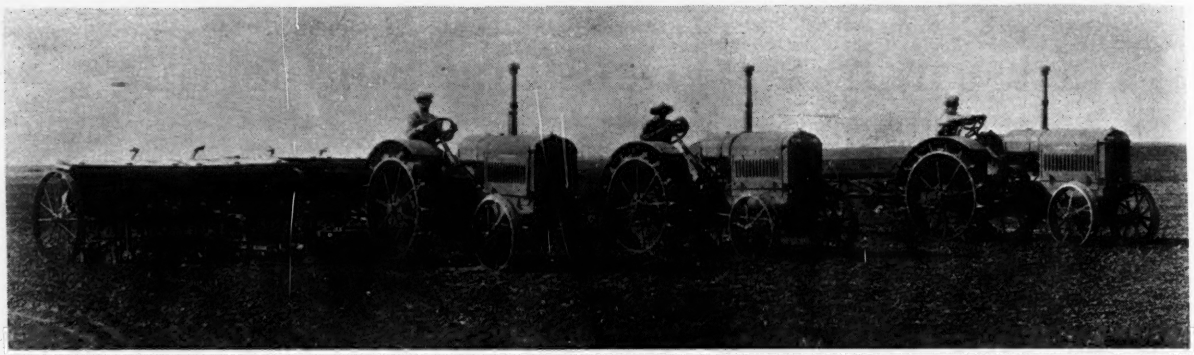
Enough data, both scientifically accurate and empirical, are available to indicate, for instance, that the amount of irrigation necessary for a certain crop will often vary quite widely with the physical and physico-chemical properties of different soils. Likewise the nature and intensity and the underdrainage of different soils to permit the occurrence of conditions favorable to crop growth and maturity are similarly influenced.

In this connection it is known that soils containing considerable quantities of either mineral or organic colloidal materials are likely to retain considerable moisture quite tenaciously and to dry out rather slowly. Where the mineral colloids predominate the soils are usually rather tough and close textured, are frequently difficult to cultivate, and become hard and impervious when dry. Such soils are usually known as heavy soils. They frequently expand on wetting and contract on drying, both of which may materially influence the effectiveness of drainage or irrigation measures, especially where the water contains alkali salts. Where the organic colloids predominate, the soils are sometimes of much looser texture and may frequently be quite friable when dry in spite of their decided contraction and settlement. The movement of water through such soils is frequently more rapid than through heavy soils.

Soils containing a high percentage of coarse, crystalline, mineral particles are, on the other hand, frequently not very retentive of moisture, and may dry out very quickly even though they contain an appreciable percentage of organic matter. The movement of moisture through such soils is likely to be quite rapid and naturally more irrigation is required to maintain the necessary supply of moisture than in heavy soils. The optimum irrigation of such soils may present the danger of injury by water-logging to lower lying soils through seepage. In addition, while heavy irrigation of such soils may remove injurious soluable salts, yet it may at the same time remove appreciable amounts of valuable nutrient salts, thus disturbing the normalcy of other growth conditions. Naturally drainage of such soils is not usually very difficult, although there is always the danger of overdrainage.

From the strictly engineering viewpoint, it would seem reasonable to assume that the physical and mechanical properties of soils will largly govern their hydraulic properties. It has been definitely shown by soil physicists that the important physical properties of soils are governed largely by

*Discussion before the 20th annual meeting of the American Society of Agricultural Engineers, at Lake Tahoe, California, June, 1926.



Three of the five tractors on the 5800-acre farm of Marion Russell, in Finney County, Kansas, photographed in the process of putting in a wheat crop. Mr. Russell is practicing, in the extensive use of mechanical power, labor-saving equipment and more efficient methods, what the agricultural engineer calls engineered farming

colloidal phenomena. There is thus considerable evidence to indicate that the degree of absorption and retention of moisture by soils is largely a function of the amount and nature of their content of colloidal materials. Naturally the manner in which moisture is retained in soil will largely govern its availability to crops and will influence the manner in which the crop utilizes it. In this connection one state agricultural experiment station definietly distinguishes between free and unfree water in soils, while another has shown that the soil water may vary from the excessive water readily removed by drainage to the water so firmly held by the soil that it can never be dried out under climatic conditions, no matter how severe. These soil-water phenomena are also considered to be governed by the soil colloids. It would also seem to follow quite logically that the colloidal materials must eventually markedly influence the movement of water in soil, whether in the process of removal under drainage or of diffusion under irrigation.

CONCLUSION

It seems quite evident, therefore, that without a knowledge of the nature of functions of the underlying soil factors governing the retention, setting free, and movement of moisture in soils, the design of an underdrainage system for a certain soil can be based upon comparative or speculative knowledge only. Similarly, while much empirical data are available on the so-called duty of water for different crops, without a knowledge of the soil factors governing the retention, setting free, and movement of water and the manner in which it becomes available in soils to plants, the development of irrigation practices, and consequently the design of an appropriate irrigation system would likewise seem to border on speculation.

It seem advisable, therefore, for agricultural engineers enigaged in reclamation practices pertaining to the regulation of soil moisture to acquire a knowledge of or to take up coperative studies with agronomists and soils physicists of the following somewhat overlapping but progressively arranged subjects:

1. The actual requirements of important crops for moisture, to permit their optimum growth and maturity.
2. The factors governing the availability of soil moisture to different crops and the manner in and conditions under which such crops utilize it.
3. The nature of the physical and physico-chemical factors of soils governing the retention, setting free, and movement of water in soils and their influence on these moisture phenomena.
4. The influences of artificial soil moisture regulation on other growth factors of soil and the expression of these influences as useful coefficients.
5. The relations of the nature and influence of the physical and physico-chemical factors of soils, governing the retention and movement of water, to run-off and duty of water, and the interpretation of these relations in terms which will permit their rational use in the design of hydraulic structures and will fully consider the normalcy of other growth factors.
6. The proper external treatment or management of extremely light or heavy soils or soils in an otherwise difficult condition to make them economically susceptible to reclamation by artificial moisture regulation measures.

A list of selected references to scientific contribution made during the past five years to the knowledge of the factors influencing the properties of soil moisture is added. Its purpose is not only to indicate the scope of some of the knowledge already available and to provide sources of recent information on the points discussed above, but to serve as a guide for the intelligent organization of fundamental studies which will eventually lead to the development of a lucid, logical, and practically useful engineering hydraulics of the soil.

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Agricultural Engineering Digest

A review of current literature on agricultural engineering by R. W. Trullinger, specialist in agricultural engineering, Office of Experiment Stations, U. S. Department of Agriculture

Evaporation on United States Reclamation Projects, I. E. Houk (American Society Civil Engineering Proceedings, 52 (1926), No. 1, [pt. 3], pp. 41-61, figs. 4).—This paper summarizes the evaporation investigations of the U. S. Department of Interior Bureau of Reclamation.

Foundations of Bridges and Buildings, H. S. Jacoby and R. P. Davis (New York and London: McGraw-Hill Book Co., 1925 2. ed., pp. XIX+665, pls. [33], figs. [330]).—This is the second edition of this book. It contains chapters on timber piles and drivers, driving timber piles, bearing power of piles, concrete piles, metal and sheet piles, cofferdams, box and open caissons, pneumatic caissons for bridges, pneumatic caissons for buildings, pier foundations in open wells, ordinary bridge piers, cylinder and pivot piers, bridge abutments, spread foundations, underpinning buildings, explorations and unit loads, pneumatic caisson practice, and references to engineering literature.

Engine Corrosion — Its Causes and Avoidance, F. Jardine, (Journal Society Automotive Engineering, 17 (1925), No. 6, pp. 605, 606).—Data are briefly reported which indicate that corrosion in gasoline engines is generally due to suphuric acid formed by the combination of sulphur carried in low-grade fuels and oils with water that enters or is generated in the engine. Much of this trouble occurs in winter, and may be traced directly to the action of water that condenses on the inside of the cylinders and crankcase when a cold engine is started. The water destroys the oil film and comes in direct contact with the metal of pistons, cylinders, and other parts, causing them to rust. If the engine is stopped before it is warmed up, condensation and rusting will be rapid.

The only completely successful method of dealing with the condensation and rust problem is to provide a lubricating system that will begin to function as soon as the engine is started. The splash system has been found to meet this requirement best. If pressure feed systems are used, it is recommended that the oil pump be located in the sump and that no oil screen finer than 30 mesh be used over the intake. Oil lines should be as straight and as short as possible and not less than 0.5 inch in diameter. Connecting rods should have a diametrical clearance of 0.0015 inch and a side clearance of from 0.006 to 0.008 inch.

Tests have not confirmed that the use of thin or diluted oils results in the rapid wear of pistons and cylinders. A castor oil film has been found to be more resistant to the action of water than a mineral oil film, and it is suggested as an inside coating for engines that are stored during cold weather.

Coordination of Irrigation and Power, W. Kelly, American Society Civil Engineering Proceedings, 51 (1925), No. 10, [pt. 3], pp. 1946-1984, figs. 16).—A detailed presentation of the factors entering into the problem of coordination of irrigation and power in the western states is given. Certain solutions are pointed out by describing some of the specific cases that have come before the Federal Power Commission.

The Transportation of Logs on Sleds, A. M. Koroleff and R. C. Bryant (Yale University School Forestry Bulletin 13 (1925), pp. 110, pls. 13, figs. 35).—The results of an investigation on the development of sled hauling methods in the logging industry are reported in considerable detail. Sections are included on logging methods in the northern United States, sled roads, the construction of sled roads, the maintenance of sled roads, logging sleds, loading sleds, power used in sled transportation, factors controlling the size of sled loads, and animal versus mechanical draft.

Summary of Results of Laboratory Experiments with Different Wood Preserving Antiseptics, S. Kamesam ([Indian] Forest Bulletin 64 (1925), pp. [2]+28, pls. 4, figs. 25).—The results of fourteen years of experiments comparing different kinds of antiseptics for the preservation of Indian woods are presented in some detail.

Field tests with arsenic treatments were satisfactory and cost less than coal tar creosote treatments. This was especially true in the case of the softer woods. However, the lives of all of the harder woods were not increased by arsenic treatments. Coal tar creosote treatments gave better results than oil emulsions or salt solutions. Earth oils had a good waterproofing effect, and it is thought that they may be mixed with coal tar creosote with advantage. No one preservative apparently possessed all of the requirements which would make its use applicable to all conditions.

Charts for Studying the Oil Film in Bearings, G. B. Karelitz (Mechanical Engineering [New York], 48 (1926), No. 2, pp. 128-131, figs. 5).—Charts are presented which provide a means of determining with sufficient accuracy the shape and pressure in the oil film for bearings under different conditions.

A Method of Determining the Dew Points of Fuel-Air Mixtures, R. J. Kennedy (U. S. Department Commerce, Bureau Standards Science Paper 500 (1925), pp. 47-63, figs. 10).—A method is outlined for determining the minimum temperatures necessary to keep a mixture of fuel and air, as used in internal-combustion engines, completely vaporized. The theory of the method is based on the assumption that the initial condensate in equilibrium with the remaining vapor is of essentially constant composition for the range of pressures and temperatures encountered in the engine manifold. The Clausius-Clapeyron equation and the ideal gas laws are then applied and an expression is developed for the temperature sought in terms of the pressure and mixture ratio of the fuel-air mixture. The expression involved several constants characteristic of the fuel, which are determined by experimental methods. The method is applied to different fuels to compare it with other methods. It was found, for instance, that the condensation temperature of alcohol secured with the method agreed to within less than one degree centigrade with those computated from Smithsonian physical tables vapor pressures. It is considered conservative to estimate that the results obtained by this method are correct to within about two degrees.

The Irrigation Problem in Kansas, G. S. Knapp (Kansas State Board Agriculture, Bienniel Report, 24 (1923-24), pp. 121-133, fig. 1).—An analysis of the irrigation problem in Kansas is presented. Attention is drawn to the fact that Kansas exercises little or no regulatory control over the use of irrigation water. Most of such irrigation water is secured by pumping. An analysis of the factors entering into the production of several crops indicates that the yield of dry matter per unit of water has in most instances decreased as larger amounts were applied. It was not found, however, that the amount of water which produced the greatest unit yield produced the greatest net profit.

It is concluded that the problem of irrigation in the state, therefore, resolves itself into one of showing the relative importance of the various factors entering into the cost of the irrigated crop and thus encouraging the use of larger amounts of water.

Properties of Typical Crude Oils from the Producing Fields of the Western Hemisphere, A. J. Kraemer and L. P. Calkin (U. S. Department Commerce, Bureau Mines Technical Paper 346 (1925), pp. II+43).—This paper contains analyses of representative samples of crude petroleum from the producing fields of the western hemisphere outside the United States. On the basis of the analysis and the sampling data, the crudes are divided into groups and their characteristics discussed.

Studies of the Biology of Sewage Disposal: The Fauna of Imhoff Tanks, J. B. Lackey (New Jersey Stations Bulletin 417 (1925), pp. 3-39, figs. 84).—Studies are reported which showed that all three classes of protozoa are represented in the fauna of the Imhoff tanks under investigation. Rhizopods were found to be fewest in genera and numbers and flagellates the most numerous. About seventy species of protozoa were encountered with some frequency, the common forms being either facultative or obligatory anaerobes. Some of the protozoa were found to come into the tanks in the free living state, and some in the encysted form. Not all of those carried in live, and some of the encysted forms do not excyst.

The Minimum Soil Moisture Available to Plant Roots, N. V. Lobanov (Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 4, pp. 243-256, figs. 6; Ger. Obs., pp. 256, 257).—Studies are reported which showed that when the soil moisture sinks below the so-called inactive supply it becomes entirely unavailable to plant roots. The inactive moisture supply is considered to be about equal to the maximum hygroscopicity of the soil, and is independent of the conditions of transpiration and absorbing surfaces.

The wilting coefficient for plants was found to depend upon the transpiration conditions and to vary from 1.5 to 3 times the maximum hygroscopicity of the soil. It did not vary widely for the different ordinary crops.

It is considered necessary in the physiological judgment of soil moisture to investigate the critical moisture values in all soil strata to which plant roots have access, since the inactive moisture, the wilting coefficient, and the maximum hygroscopicity of soils may vary widely. This is said to be especially true of podsol soils. It is also concluded that for practical purposes the wilting coefficient may be taken as double the hygroscopicity.

Chemical Equilibrium in Gases Exhausted by Gasoline Engines, W. G. Lovell and T. A. Boyd (Industrial and Engineering Chemistry, 17 (1925), No. 12, pp. 1216-1219, figs. 3).—The results of 58 exhaust gas analyses are presented and discussed. A correlation of these results indicates that four of the components are in such proportions that the calculated value of the equilibrium constant K of the water gas reaction $CO_2+H_2=CO+H_2O$ lies for the most part within narrow limits, namely, 3 to 4, and that these limits are substantially the same for all conditions of mixture ratio and other variables. The magnitude of K obtained in this way corresponds to equilibrium conditions that prevail at temperatures of from 1,350 to 1,550 degrees Centigrade.

The composition of the exhaust from gasoline engines at different fuel-air ratios confirms the hydroxylation theory of combustion of hydrocarbons and further disproves the old belief that the reason for the maxima of the power curves of gasoline engines occurring at about 85 per cent theoretical air lay in a preferential burning of hydrogen.

The Gripping Action in Motor Plow Tests, Martiny (Technik Landw., 5 (1924), No. 10, pp. 197-199, figs. 9).—Tests of the efficiency of the drivewheel equipment of six agricultural tractors on heavy sticky soil are reported.

The results indicated that the proper design of drivewheel equipment, and especially of the lugs of agricultural tractors, is dependent chiefly on the soil conditions. On the heavy sticky stubble soil, cross lugs gave better results than spiral lugs. Narrow slots in the wheel rim were useless, and wide slots assured traction but with a great waste of power. Side extensions of lugs gave good results, but broad wheel rims with small lugs gave almost as good results.

A Machine for Comparing the Lubricating Properties of Oils at High Pressures, C. F. Marvin, Jr. (Journal Society Automotive Engineers, 17 (1925), No. 3, pp. 287-289, figs. 5).—In a contribution from the U. S. Bureau of Standards a special machine is described for investigating the behavior of various lubricants, cutting compounds, and bearing materials under high bearing pressures. The tests made with the machine have so far been in the nature of preliminary tests to determine the possibilities of the machine as a texter of oiliness and of cutting lubricants.

The data indicate that with smooth and accurate grooves and balls, consistent and reproducible results can be obtained. They also show decided differences in the friction reducing properties of different oils below the point of noticeable abrasion. Beyond this point the friction varies widely as the rubbing surfaces wear, and no consistent values of the coefficient have been obtained. The character of the abrasion was of interest, however, as it seemed to be related to the nature of the lubricant.

The Degree of Action of Wind Power Machines, E. Moeller (Technik Landw., 6 (1925), No. 10, pp. 239-243, figs. 4).—A mathematical analysis of wind power machines is presented, together with actual test data, indicating that the maximum useful wind velocity lies close to 10 meters per second (22.43 miles per hour).

An Investigation of the Fatigue of Metals, Series of 1925, H. F. Moore and T. M. Jasper (Illinois University Engineering Experiment Station Bulletin 152 (1925), pp. 92, pl. 1, figs. 28).—This is a progress report of studies on the properties of metals such as are used in the moving parts of machinery (Agr. Engin., vol. 6, p. 41).

At elevated temperatures a marked difference was found between the ultimate tensile strength of various metals as determined by ordinary static tension tests and by prolonged and retarded tension tests. This difference became noticeable at temperatures varying from 400 to 800 degrees Fahrenheit. As the temperatures increased beyond these limits the ratio of ultimate tensile strength, as determined by ordinary tests, to ultimate tensile strength, as determined by prolonged and retarded tests, also increased. Metals having a high nickel content showed the least decrease in ultimate tensile strength and proportional elastic limit as the temperatures were increased in both ordinary tests and in prolonged and retarded tests.

Fatigue tests of two steels subjected to reversed flexure at elevated temperatures showed that the endurance limits increased slightly from ordinary temperatures up to 900 and 500 degrees, respectively. For other steels the endurance limit decreased slightly from ordinary temperatures up to temperatures of about 800 degrees. The endurance limit decreased rapidly for all steels at temperatures above 900 degrees.

The endurance limit approached the ultimate tensile strength given by prolonged and retarded tests above some particular temperature for each steel. This is taken to indicate that the results of a fatigue test at 1,500 cycles of stress per minute should be compared with the results of an ordinary static test rather than with those of a prolonged and retarted test.

Small holes were found to reduce the resistance of a specimen to reverse flexural stress from 57 to 82 per cent. The type of magnetic survey used was found to furnish an indication as to homogeneity or as to internal stress conditions in steel, but did not clearly distinguish good steel from poor steel.

It is suggested that, as a basis for determining a safe working stress for a nonferrous metal under repeated stress showing no well defined endurance limit, the stress which will cause failure be taken as that for which a logarithmic curve of stress and cycles thereof intercepts the coordinate which represents the estimated life of the machine in which the metal is incorporated.

Cold drawing was, in general, found to be very effective in increasing the static elastic strength and the static ultimate strength of nonferrous metals. Cold drawing was much less effective in raising the fatigue strength of such metals. The proportionate improvement of such fatigue strength caused by cold drawing was much less for nonferrous metals than for steel.

It appeared that the ratio endurance limit to ultimate tensile strength was distinctly lower for nonferrous metals than for wrought ferrous metals. Furthermore this ratio varied widely for different nonferrous metals and for different treatments thereof. It was found that the fatigue strength of nonferrous metals cannot be determined reliably by short time tests, in which the rise of temperature of the specimen is measured after about a thousand cycles of stress.

Case carburizing, accompanied by suitable heat treatment, was found to be a promising means of increasing the fatigue strength of low carbon steel under cycles of flexural stress. Increases of endurance limit as high as 162 per cent were noted.

The Municipal Sewage Farm, Nagpur City, R. G. Allan (Central Provinces and Berar [India] Department Agriculture, Experiment Farm, Agricultural College, Nagpur, Report 1923-24, pp. 33-35).—A brief description of this farm is given, together with data on the crops, yields, and receipts therefrom. It is noted that it was impossible to deal with all sewage received on the limited experimental area. A certain amount of the excess was therefore run into lagoons on one corner of the farm during cold weather and allowed to precipitate. When this sludge dried out it developed into a valuable manure.

Value of Bituminous Coal and Coke for Generating Steam in a Low-Pressure Cast-Iron Boiler, C. E. Augustine, J. Neil, and W. M. Myler, Jr. (U. S. Department Commerce, Bureau Mines Technical Paper 367 (1925), pp. IV+45, pl. 1, figs. 19).—Tests made at various rates of steaming with Pittsburgh lump coal, Lower Kittanning coal, and by-product coke in a hand-fired low-pressure cast-iron boiler for building heating are reported.

The calorific value of the Pittsburgh high volatile lump coal ranged from 13,150 to 13,750 B.t.u. per pound, that of the coke from 11,720 to 11,890, and that of the lower Kittanning medium volatile coal from 12,970 to 13,570 B.t.u. The bituminous coals contained less ash than the coke, about the same amount of moisture, and much more volatile matter. The medium volatile coal was of smaller size than the coke or the high volatile coal, and it packed when fired, causing greater resistance to the flow of air through the fuel bed. It also required more frequent slicing and breaking up of the fuel bed to maintain the desired rate of burning. The fuels with the higher ash content required the removal of more refuse from the grate. The percentage of clinker was highest with coke.

At low ratings the bituminous coals and coke were of about equal steaming value. At medium and higher ratings the coals evaporated more water than the coke. When coke was burned at a low rating the over-all efficiency was about 76 per cent, but at the higher ratings this efficiency was less than that of the bituminous coals, being about 66 per cent.

The thermal efficiencies ranged from 65 to 74 per cent for the high volatile coal, and varied considerably at the high ratings. The thermal efficiencies for the medium volatile coal ranged from 66 to 72 per cent.

It was found that, other factors being unchanged, the nearer to the fuel bed the secondary air is supplied and the more thoroughly it is mixed with the rising combustible gases, the sooner the combustion will be completed and the larger will be the proportion of heat absorbed by the heating surfaces from the products of combustion. The pressure drop of air through the fuel bed was about the same for coke and high volatile coal, and was about half of that required for equal ratings with the medium volatile coal.

The medium volatile coal was slower to ignite and burn than the high volatile coal, and showed a tendency to form dead spots and air holes in the fuel bed. It burned unevenly and required much more attention than either of the other fuels.

How Farmers Can Secure Electric Service by Cooperative Effort, G. H. Morse (Pennsylvania Department Agriculture Bulletin 412 (1925), pp. 22, figs. 4).—A plan to secure electricity for farmers of Pennsylvania by cooperative effort is outlined in some detail.

Rural Electrification in California, B. D. Moses and G. C. Tenny (Journal Electrification, 54 (1925), No. 12, pp. 581-585, figs. 9).—An outline is given of the rural electrification work in progress in California, much of which is being done at or in cooperation with the California experiment station. The work has shown that the principal agricultural users of electricity, aside from the home, are the poultryman, orchardist, dairyman, and farmer requiring pumped water for irrigation. Several miscellaneous uses for general farming are also mentioned. The greatest need is said to be for a portable motor between 5 and 10 horsepower for utility purposes.

The Effect of Threshing Upon Wheat, O. Munerati (Compt. Rend. Acad. Agr. France, 10 (1924), No. 15, pp. 469-473; abs. in Internatl. Rev. Sci. and Prac. Agr. [Rome], n. ser., 2 (1924), No. 3, p. 709).—A brief summary of studies on the injury to grain by mechanical threshing is presented. It was found that the injury sustained by Italian seed wheats from machine threshing ranged from 2 to 4 per cent, and is considered to be practically negligible. On the other hand, experiments in Switzerland showed injury ranging from 20 to 26 per cent. It is concluded that the solution of the problem varies according to the case, and the suggestion is advanced that the different rates of threshing may be one of the causes of the variations in the number of grains that are broken during threshing operations.

Soil Tillage for Spring Seeding, W. Nitzsch (Technik Landw., 6 (1925), No. 10, pp. 236-239, figs. 2).—Tests of different methods and machines for spring seedbed preparations are briefly reported.

Scarified soil was found to retain winter moisture better than plowed soil. Seed drills with ordinary drill shares were found to work irregularly in very loose soil, and the seed did not have the correct contact with the soil particles. Rolling of scarified soil resulted in a better structure in this connection. Rolling of seeded rows resulted in a more dense soil structure and a better contact of the seed with the soil. Such treatment also resulted in a higher water retaining capacity of the row soil than of that between the rows.

The President's Annual Address*

By F. A. Wirt

IN ANALYZING the work of the Society a little over a year ago, the conclusion was reached that a full-time secretary was imperative and that agricultural engineering needed many times the publicity which it had received up to that time. We were muscle-bound and otherwise handicapped for lack of a full-time secretary.

To finance the secretary we had two sources of revenue: Membership and advertising in the Journal. The latter offered the quickest way of getting on a financial basis that would justify employing a secretary on full time. By the middle of last summer, sufficient advertising had been arranged for so that Mr. Olney could move to St. Joseph, Michigan. Since then he has devoted all his daylight hours, and much of the night as well, to the interests of this organization.

At the present time we have a nice balance in the treasury. But is desirable that, as an organization, we build up a surplus that will take care of the needs of the Society should business conditions at any time in the future be less satisfactory that at present.

There is no limit to the work that can be done by the secretary's office of the American Society of Agricultural Engineers. At the time Mr. Olney began devoting his entire time to the interests of this Society, the work was so great that instead of one we should have had two men. We are not yet in a position to employ another man, although the work deserves it.

As a member of the Society I have known for many years that Secretary Olney was doing a great work for agricultural engineering, but not until the past year did I realize how much he was doing for the Society and for the profession in which we are engaged.

"Agricultural Engineering." Upon the financial success of our monthly journal depends, I believe, the success of the American Society of Agricultural Engineers. This is a strong statement but I do not believe it is an exaggeration. The importance of the Journal should be stressed again and again whenever agricultural engineers get together and plan for the future best interests of our profession.

Within the past few months several short illustrated articles full of valuable information have appeared in the Journal. These short articles have done a great deal to arouse interest on the part of members and others in the contents of our magazine.

The members of the Society have the responsibility of furnishing Secretary Olney with original articles on all subjects of interest to our profession. It is not good policy for a society like this to pay for such contributions, but to have articles appear in ARICULTURAL ENGINEERING should be looked upon as an honor, which it is.

By following this practice we can increase the number of readers, foster the interest of all members of the Society in agricultural engineering and bring about the realization that AGRICULTURAL ENGINEERING must always be referred to when authentic, up-to-the-minute information is desired on agricultural engineering.

A word as to advertising, which makes possible the Journal and a full-time secretary. You have noted the increase in advertising. The thanks of this organization are due the advertisers. When a new advertiser appears in the Journal and offers to send information which you do not have in your files, it would be mutually helpful if you would write asking for the information offered.

As an advertising medium, the Journal is productive of results. That we know to be true. But, because of the rather small number of readers, it is very important that we continually emphasize the value of the Journal to our members, including student members, and its use as a reference by agricultural and agricultural engineering students.

Other things being equal, I feel as if the members of this organization should make it a definite policy to patronize the advertisers in our Journal first.

Transactions. The 1925 Transactions are now being mailed. Within the last thirteen months the secretary's office has printed virtually three years' Transactions. It is planned that the proceedings of this meeting will be printed within a few months. In other words, we are gradually shortening the interval between the annual meeting and the time of printing the Transactions.

Complete papers and reports, after being passed upon by the Publications Committee, will appear in the Transactions. Extracts of many of the articles and reports can well appear in the Journal by this change of policy, that is, printing the Transactions months earlier. This only emphasizes the need for original articles well illustrated and full of valuable information.

Publicity. Information, facts, data are all of little value unless disseminated. Furthermore, too many people in this country do not yet fully understand the significance of the part played by engineering in agriculture and of the importance of agricultural engineering. For that reason every effort has been made to secure favorable publicity.

Special mention should be made of our radio program presented from January to April. Each week an agricultural engineering address was broadcast over Radio Station WLS of Chicago. The cooperation of members in preparing the addresses made this program possible. Special thanks are due those agricultural engineers who helped in this very worthy educational effort. The thanks of the Society are especially due K. J. T. Ekblaw, who acted as chairman of the Radio Committee and took upon himself the responsibility of seeing that these addresses were delivered.

In other ways every effort has been made to secure publicity for agricultural engineering. Your president has not hesitated to ask for the privilege of addressing groups on the subject whenever he thought it desirable. Many of our members have prepared articles on agricultural engineering which have appeared in the farm papers.

At a meeting of farm paper editors in Chicago last December, Dr. White, Mr. Yerkes and your president all spoke on agricultural engineering subjects. This effort proved very much worth while.

Your special attention is called to page 204 of the June issue of AGRICULTURAL ENGINEERING in which E. S. Bayard, editor of the "National Stockman and Farmer," in a letter to Prof. Blasingame, comments on agricultural engineering as follows: "One thing I have noted with special interest and that is the disposition of our readers to give you their experiences on agricultural engineering problems. In the past the farmer's part in agricultural engineering has been that of an inquirer. Now he is taking part in these discussions the same as in other farm problems. I consider this a significant sign of progress."

The importance of publicity for agricultural engineering is brought out clearly in a resolution passed at a meeting of the Advisory Committee of the College Division of the Society held in Washington, D. C., in March, as follows:

> WHEREAS, the relation of agricultural engineering to agriculture is not generally understood and the service of the agricultural engineer to the progress of American agriculture is not appreciated, and
>
> WHEREAS, it is felt that the rapid advancement of the agricultural engineering profession is dependent upon a program of general education to create a better understanding and appreciation of the work and service of the agricultural engineer, therefore,
>
> BE IT RESOLVED that the Advisory Committee of the College Division of the American Society of Agricultural Engineers respectfully request the officers of the Society to publish an illustrated pamphlet of information which

*Before the 20th annual meeting of the Society, at Lake Tahoe, Calif., June, 1926.

shall set forth in the most effective and practicable manner the following:

First, the relation of agricultural engineering to raising the efficiency of farm labor through the application of power to farm operations

Second, the advance in the general well-being of the farm workers on account of the change in farm labor wrought by the introduction of farm machinery

Third, the relation of agricultural engineering to land development accomplished and made possible through drainage, irrigation and land clearing, and through soil conservation by the prevention of soil erosion

Fourth, the improvement of housing and sanitary conditions in rural communities which have been and may be brought about by engineering practice.

The incoming Council will pass upon this resolution, but it should be rcognized that more publicity can be obtained if individual members will do their part. Opportunites never cease to tell the story of agricultural engineering. We are afflicted with that well-known failing of engineers, that is, to depend too much upon deeds to do the talking. We must not only perform our tasks with high efficiency, but we must also see to it that the public at large knows what the agricultural engineers are doing and can do if the opportunity is presented to them.

When members leave for section, division or annual meetings, they should arrange for an article about the fact to appear in their local newspaper. It isn't necessary to say much about the individual, but very often paragraphs on agricultural engineering can be added which will tell the story to the readers.

Membership. Through the activities of the sections and many of the individual members, our membership has shown an increase over last year. As yet, however, too many well-qualified men do not belong to this organization. We have not been able to devote the time to securing members that we had planned on last summer, but we have ready for the incoming administration a large list of prospective members which, with other assistance, should make it easy to add to our membership in the near future.

This effort should not be confused with a membership drive, for we are interested only in worthy members, that is, men who properly can belong to a professional organization of high standing which is interested in the application of engineering principles to agriculture.

Appointments. The president's policy this last year has been to change the chairmen of divisions and committees wherever it was possible to make a change. Such a policy has disadvantages, but it possesses advantages which merit serious consideraiton. In this organization are men who have carried the burden for years. They are absolutely to be relied upon when their services are requested. They are familiar with the work of the society; they need very little guidance. But we are confronted with the fact that this is a growing organization, that the needs of the Society are so tremendous we cannot make the progress we should unless we make use of an increasingly large number of members. Furthermore, it is significant that members of any organization are most interested when they have a definite task to perform. What does it matter if the work of a committee or a division is slowed up a trifle, if we have given another member of the Society an opportunity to show what he can do for agricultural engineering. It doesn't follow that placing a man hitherto untried as a chairman of an important committee or division means that the work will be below par or not on the same plane with previous work of the committee or division.

There is nothing of greater importance confronting the Society today than the necessity of utilizing our newer members. If it is necessary for the leading members of the organization to step aside in favor of untried members, as far as our formal organization is concerned, that should be understood as a tribute to the more active members who can then individually work for the Society in a personal way that will make their influence exceedingly far-reaching.

If we are to do our duty to the new members, if we are to make use of their services, if we are to increase our membership, we must so arrange our organization that the newer, untried men are given an opportunity to show what they can do.

Division and Section Chairmen. The Society has now grown to the point where the division and section chairmen are as important to our organization as the president was not many years ago. Any man appointed division chairman or elected section chairman should accept his appointment or election as a great responsibility. Recognition of their importance by individual members is to be desired, for this offers one way of relieving much of the strain now on the secretary's office.

For the last two years I have noted with no little concern the amount of detail which is thrown upon the secretary's shoulders. It is important that we maintain a closely organized society, but we must recognize the fact that agricultural engineering has several broad phases. The chairmen of the divisions representing these phases must, therefore, assume much of the responsibility of seeing that the division does the work throughout the year. As a general principle, division, section and committee chairman should follow the policy of relieving the secretary at every opportunity, never forgetting, however, to send copies of their correspondence to the secretary and when justified to the president so that both can be kept fully informed of what is going on.

I wish to take this opportunity ot express my appreciation of the work done by the division and section chairmen. They deserve more thanks from the members than they are likely to get.

Division Meetings. The policy of holding division meetings seems to be working out nicely. The Farm Power and Machinery Division held a meeting last December in Chicago which attracted a large number and was a success in every way.

The Farm Structures Division sponsored the Farm Homes Conference in Chicago during February of this year. That, too, was an unqualified success. The Reclamation and Rural Electric Divisions have not yet held divisional meetings. In view of the number of organizations in which rural electrification is receiving attention, it would seem undesirable for the Rural Electric Division to hold a meeting inasmuch as their members take such an active part at various meetings devoted ot this subject.

As for reclamation, it is receiving considerable attention at the section meetings and perhaps a separate division meeting is not necessary in the near future.

These meetings offer many members and friends of the organization the opportunity to get together to discuss agricultural engineering problems, an opportunity which they don't always have in connection with our annual meetings. For that reason it is very important that we continue to stress yearly at least one meeting each of the Farm Power and Machinery and the Farm Structures Divisions separate from the annual meeting.

Section Meetings. Geographical sections of the Society are necessary in view of the immensity of the country and the fact that all members, therefore, cannot attend the annual meeting every year. It was my great pleasure to attend the meeting of the North Atlantic Section at Schenectady last December. It was one of the best agricultural engineering meeting I have ever attended.

At section meetings local problems may be discussed, members and visitors can become more closely acquainted, and all in all such meetings can be a great inspiration to agricultural engineers attending.

The Pacific Coast Section has been a strong factor in the growth of our Society since it was organized. Thanks to that section we are enjoying California hospitality and seeing the application of engineering principles to conditions in territory unfamiliar to the most of us.

The Southern Section is being organized, and the Southwest Section is growing and will have a meeting in the fall.

The Vice-President. Very capable men have been elected first vice-president of this organization, but to date we have not made use of their services. In the past the vice-president has assisted the secretary in financial matters, especially in the way of countersigning checks, but as the secretary is now bonded and the accounts are audited by professional auditors it would seem as if this duty no longer exists for the vice-president.

It may be that the work of this officer should vary from year to year. On the other hand, it may be possible to turn

over some particular task for this officer to perform regardless of changes. At any rate, the best minds of the organization should be at work on the problem of making the vice-president more effective in Society affairs.

Consulting Agricultural Engineers. The attention of the Society is called to the importance of emphasizing the development of consulting agricultural engineering. Your president has had considerable correspondence with different members of the organization on the whole matter of consulting agricultural engineering. It has been suggested that we organize a special division for consulting agricultural engineers. The object of this organization woold be to lay down strict requirements for membership so that members of that division would be thoroughly qualified to do consulting work, and for the purpose of maintaing high professional standards.

Our profession will be far in advance of where it is today when consulting agricultural engineers form a much larger part of our membership. I believe we can look forward to the time when a larger number of agricultural engineers will be doing consulting work. In the meantime, the Society can well afford to give this problem the most serious consideration.

Standardization and Elimination. .The work of standardization and elimination carried on by this society is good as far as it goes, but not yet has it gone far enough. A great deal of work has been done, but too few have carried the burden. The need for greatly increased activity is evident to anyone even remotely associated with the commercial phases of agricultural engineering and with the work of the Department of Commerce and the American Engineering Standards Committee. Arrangements are being made whereby the Society can devote more attention to the important work of standardization and elimination.

European Corn Borer. Within the last few years the European corn borer has relentlessly advanced from Ontario to Ohio. It is thought now that nothing can prevent the spread of the corn borer throughout the corn belt within the next few years. It is also recognized that successful methods of control depend quite largely upon the work of the agricultural engineer. At the Ohio State University and the University of Illinois the agricultural engineering departments have been attacking this problem. It would seem as if the time is at hand when the Society should exhaust every effort in developing and making known methods of mechanical control.

Waste in Agriculture. One of the greatest opportunities, if not the greatest, which ever confronted the American Society of Agricultural Engineer is our responsibility in connection with the study to be made of waste in agriculture.

You have all heard more or less of the famous study on waste in industry by American Engineering Council, as a result of which far-reaching standardization and elimination is taking place in many industries. Now the time has come when a study is to be made of waste in agriculture. Obviously, it is a work that, as far as the engineering and power aspects of production on the farm are concerned, must be undertaken by the agricultural engineers.

The second phase of this waste study is the industries using agricultural products as raw materials.

It is not necessary to go into detail regarding this study of waste in agriculture, but I ask for the chairman of the committee that he be accorded every possible cooperation, for this represents one of the greatest opportunities the Society has ever had.

The farmer wants to make a larger profit, for then he can enjoy more of the good things of life. He can get more through an increased selling cost or by reducing the cost of production. Competing as we are in a world market, it is not likely that the individual farmer can greatly control selling cost. He can control cost of production. This can be reduced in various ways. According to the U. S. Department of Agriculture, 60 per cent of the average cost of production is found in the two items of power and labor. Other items, such as land, rent, taxes, insurance, etc., are much smaller and are not subject to much change by the individual.

As agricultural engineers we know that, if the farmers of this country wish to make greater profits, the most successful way is to reduce the cost of production.

Summarizing, I wish to make the following recommendations:

1. Build up a surplus in the treasury
2. Members contribute short illustrated articles to the Journal
3. In every way possible secure more publicity for agricultural engineering and agricultural engineers
4. Increase the membership but maintain high standards for admittance
5. Give the new and untried members more responsibility in the work of the Society
6. At all division and section meetings consider and outline a definite program of work for the coming year
7. Continue to hold division meetings of the Farm Power and Machinery and the Farm Structures Divisions. Consider the advisability of holding Reclamation and Rural Electric Division meetings
8. Place more emphasis upon section meetings
9. Give the first vice-president a position of real responsibility in the work of the Society
10. Develop consulting agricultural engineering as fast as possible
11. Push standardization and elimination where practical
12. Take a prominent part in the fight against the corn borer
13. Put every possible effort behind the study of waste in agriculture
14. Study agricultural production

In the foregoing I have reported in part on the work of the Society during the past year, and I have made certain suggestions for the coming year. It would be well, however, if the members would give these recommendations thought and from time to time during the meeting bring up the matters which pertain to the program of the moment; also discuss with the new officers of the Society, those points which you wish to emphasize.

A well-planned program is essential for the best interests of the Society as well as for the best interests of the divisions and sections. Continuity of effort will be followed by greater results and more widespread recognition of the importance of agricultural engineering.

In conclusion I wish to refer to the responsibility of each individual. I will illustrate by two instances. Nearly a year ago I was talking to one of our eastern members who is connected with a manufacturer.

"For years," he said, "I had been asked by one of the members to join thee American Society of Agricultural Engineers. Finally I did so. Now I appreciate what agricultural engineering means."

A few months before I was visiting an editor of a farm paper. Our business was transacted in fifteen minutes, but the conversation in which the editor did most of the talking, he happened to mention his association with a prominent agricultural engineer, a member of this Society who had spent considerable time with the editor in previous years and had shown him what agricultural engineering means.

These are only two instances of many that might be given to illustrate how individuals have assumed their responsibility and have "carried the message to Garcia."

A few of the things to be done by this Society have been mentioned. More will be discussed within the next few days. But after all we must go back to the basic principle—maximum results can only be achieved by individuals assuming their responsibility to carrying on the work of agriculaural engineering.

"If we are to do our duty to the newer members, if we are to make use of their services, we must so organize that the newer, untried men are given an opportunity to show what they can do."—F. A. Wirt.

A. S. A. E. and Allied Activities

Lake Tahoe Meeting An Outstanding Agricultural Engineering Event

NOW that members of the Pacific Coast Section of the American Society of Agricultural Engineers have seen the culmination of their efforts to have an annual meeting of the Society held winthin the territory of the Section—at what one authority calls the most beautiful spot in the new world—it is not too much to say that these efforts have been crowned with success. The 20th annual meeting of the Society held at Tahoe Tavern, Lake Tahoe, California, June 23 to 26, was more than a success; it was a real achievement for which the Pacific Coast Section was largely responsible and for which it deserves credit beyond the power of words to express.

The meeting at Lake Tahoe was in one sense a repetition of each of the annual meetings of the Society of the past few years, in that the progress and achievements recorded in our profession, quality of papers presented, the development of individuals in the profession, etc., indicate a substantial advance over the meeting of the year previous. If this year's meeting gave evidence of one thing more than another, it was that agricultural engineering is going forward by leaps and bounds. From the time that L. J. Fletcher, in charge of the program and meeting arrangements, called the meeting to order until F. A. Wirt, retiring president, handed the gavel to O. W. Sjogren, the president-elect, and the 20th annual meeting had passed in to history, the tremendous progress being made in our profession was apparents. Even members most active in the affairs of the Society apparently had not previously realized the extent the profession had advanced during the past year.

The American Society of Agricultural Engineers is particularly fortunate in the men who comprise its membership. During the meeting President Wirt stated that the spirit that seemed dominant in the organization reminded him of the spirit of the Crusaders. One thing is certain, the Society's record of achievement, from the professional standpoint, is based on the achievements of its individual members.

With the increase in the activities of the several technical divisions of the Society and the desirability of encouraging meetings of these divisions separate from the annual meeting, the need for providing for more general sessions at our annual meeting, the purpose of which is principally to "tie in" or correlate the interests of the several divisions with each other, has in the past few years become more apparent to members charged with the administration of Society affairs and also to those responsible for building our meetings programs. At the Lake Tahoe meeting this year three half days were given over to general sessions at which were featured papers and addresses of interest to all agricultural engineers.

President's Annual Address Summed Up the Year's Achievements

The first general session on Wednesday afternoon, at which the meeting was formally opened, featured the annual address of the president, F. A. Wirt. Mr. Wirt's address was a particularly fitting climax to an administration with a real record of achievement behind it. Appreciating the tremendous field of agricultural engineering and its importance in the development of the agricultural industry, Mr. Wirt realizes the need of a strong organization to represent agricultural engineers and coordinate their activities in their relation to the general agricultural scheme. His address therefore stressed the development and achievements of the Society as well as its needs and the relation of its growth to the development of its individual members.

Agricultural engineers have long recognized that the progress of their profession, and incidentally the development of engineering as applied to agriculture, and in like manner their ability to render an outstanding service, was founded largely on the advance of research in this field. Speaking on a national program of research in mechanical farm equipment J. Brownlee Davidson, senior agricultural engineer of the U. S. Department of Agriculture, discussed in detail the progress being made by the research survey in this field. He pointed out that a total of 110 projects relating to mechanical farm equipment have been reported and that the number has increased rapidly during the past two years. In inaugurating this survey Prof. Davidson asked for suggestions of research problems and has received a total of over 800 suggestions. In his address he made this significant observation: "It is evident that there is much interest in research work and rapid progress is assured if right methods are used in preparing a program. R. B. Lourie, vice-president of John Deere Plow Company, representing the National Association of Farm Equipment Manufacturers, in his address, entitled "The Manufacturer's Place in a Farm Machinery Research Program," called attention to the large sums expended annually by farm equipment manufacturers in research and experimental work. In his opinion this effort could be coupled up most effectively with projects undertaken at state experiment stations.

Close Relation Between Engineering and Economics Featured

Gradually but none the less surely engineers in all fields of activity are recognizing the inseparability of engineering and economics. In recent years agricultural engineers have come more and more to appreciate that the true development of engineering as applied to agriculture is based primarily on its economic relationships. At the Lake Tahoe meeting of A.S.A.E. was stressed the interdependence of engineering and economics in the development of the agricultural industry. Undoubtedly the keynote of the meeting was sounded in the statement that "Agriculture must not be content to devote, as at present, 2.18 hours to manufacure products exchangeable for other products the city man produces in one hour," contained in the address of Arthur Huntington, public relations engineer of the Iowa Railway and Light Corporation and chairman of the Rural Electric Division of the Society. Challenging the current belief that vital and inherent differences prevent the application of modern manufacturing efficiency principles, it was pointed out that the conversion of raw materials into more or less finished products on the farm is manufacturing subject to the same engineering control of costs and needing the same planned control of production volume and the same control of merchandising of the product as any other industry. The use of machinery to economize labor and the increased efficiency of operating in large units was also stressed. After the manner of the engineer it was pointed out that our agriculture, although the most advanced in the world, is now in 1926 operating on a plane equal to the operation of the factories of two centuries ago. In this connection it was pointed out that the American Society of Agricultural Engineers is the most logical and competent agency to survey American farming, analyze its methods, determine its costs, and promulgate the methods and management found most efficient from the engineering viewpoint. In this the Society would undoubtedly receive the backing of banks, insurance companies and other investors in farm securities, of the federal departments of agriculture and commerce, and of associations representing agriculture, the agricultural press and makers of farm equipment.

An outstanding feature of the meeting was the presence of Dr. Elwood Mead, U. S. Commissioner of Reclamation, and incidentally an honorary member of the Society. Dr. Mead had a message of intense interest to all agricultural engineers.

His address dealt with the subject of federal reclamation in which he reviewed the status of reclamation in this country and the progress that has been made. He pointed out that the paramount need of reclamation at the present time is a settlement and farm development program which will attract to and hold on the government reclamation projects people who love the soil and have a pride in their calling. Believing that this is the pressing problem of federal reclamation at this time, he pointed out that in presenting it to an annual meeting of the American Society of Agricultural Engineers that he was getting it before the logical organization fitted by training and experience to help in its solution.

Agricultural engineers are ever eager to receive a challenge that affects their profession and the individual members of it. J. V. Mendenhall, president of the Holland Land Company, in his address, entitled "Wanted: An Agricultural Engineer," stated that in his opinion an agricultural engineer should ultimately desire to become more than an engineer and more than an agriculturalist. If his desire was to become a highly paid executive manager or consulting adviser on reclamation projects or other agricultural enterprises, he should not only know farming and engineering but also be familiar with accounting, methods of financing, the law as it affects the leasing of lands, subdivision planning, the selling of lands and the handling of long-term contract purchases, the laws of the state as related to reclamation and irrigation districts, the many kinds of farming and marketing regulation, something about cooperative marketing, handling of mortgaged crops in the case of delinquent buyers, as well as a number of other subjects. Mr. Mendenhall's address was indeed a challenge and whether or not we agree with his specifications for an agricultural engineer, in their entirety, his address contained an abundance of food for serious thought by the members of the profession.

An interesting presentation of the use of earth in building construction by J. D. Long, junior agricultural engineer of the University of California, was an important feature of the general program. A valuable technical discussion covering both the economic and engineering factors which enter into rate making and rural extension policies, in providing the farmer with electric service, was presented by L. S. Wing, engineer for the California Farm Bureau Federation. Farmer psychology in connection with rate forms and extension contracts was especially stressed in Mr. Wing's address. Another important feature of the general program was the presentation of some new and interesting data very much in conflict with the generally accepted ideas on the subject, on the water requirements of agricultural crops. In his paper, entitled "Irrigation in relation to Soil Moisture and Plant Growth," F. J. Viehmeyer, associate irrigation engineer of the University of California, presented the results of experiments which upset much of the generally accepted knowledge on the relation of soil moisture to plant growth.

Programs of Division Sessions of Unusual Interest and Value

At the sessions of the Farm Structures, Rural Electric, Farm Machinery, Reclamation, and College Divisions many technical subjects of exceptional interest were presented and discussed. Lack of space prevents even a brief discussion of these programs, but the papers, reports and discussions presented will be available to members either in the form of abstracts in AGRICULTURAL ENGINEERING, publication in full in the 1926 Transactions of the Society, or in other form. A new feature of the division programs this year was the discussion and formulation of plans for the 1926-27 activities of each division. At succeeding annual meetings this phase of the divsion programs will become an increasingly important feature. The new policy which was undertaken at the Lake Tahoe meeting to complete the appointment of division and committee personnel for the ensuing year, before the meeting is brought to a close, and the outlining of definite objectives and a program of work for the various divisions and committees will necessitate devoting considerable discussion during the division sessions.

One of the most significant developments of the Lake Tahoe meeting was the conference of consulting agricultural engineers. What this conference lacked in numbers it made up in enthusiasm, harmony of ideas, and a determination to establish consulting practice in this field on a basis that will make for the development of high standards and ethics in this most important field of agricultural engineering. So much progress was made in outlining a program of activities that it is understood the group of consulting agricultural engineers will in the near future petition for the organization of a separate division in the Society for the purpose of insuring that consulting practice in this field will eventually be developed to a degree comparable with that in other outstanding fields. The relation of the consulting agricultural engineer to the agricultural engineering specialist was a leading topic of the discussion. The attitude and the point of view of both the consulting engineers and agricultural engineers connected with state colleges and universities were so much in harmony on this subject that the problem on analysis does not seem to present any serious difficulties in the way of solution.

Again space does not permit of a discussion of other important conferences which featured the annual meeting, such as the "at-dawn" sessions of the state leaders of rural electrification projects, the land clearing conference, a meeting of the heads of college agricultural engineering departments, and a soil dynamics conference.

The annual meeting, as in the past, offered an excellent opportunity for members interested in a particular phase of agricultural engineering to get together for conferences which were of special interest and benefit to the men individually and which are the means of contributing in a substantial way to the development of the several branches of agricultural engineering. Because of the demand for so many of these conferences it will be necessary at future meetings to provide for the holding of many of these conferences either before or after the meeting proper so as not to conflict with the interest and attendance of the scheduled sessions and also to give more time between sessions for members to get acquainted with each other and for informal discussions or conversations which are so valuable and so important a feature of the A.S.A.E. annual meetings.

Annual Business Meeting Featured Many Interesting Reports

At the annual business meeting in addition to the report of the Secretary reports were made by the Society's representative on American Engineering Council, H. B. Walker; the Standards Committee, including the Society's cooperation with the American Engineering Standards Committee, O. B. Zimmerman, Chairman; Publications Committee, S. H. McCrory, Chairman; Research Committee, E. C. Easter for M. L. Nichols, Chairman; Southwest Section, D. G. Carter, Chairman; Pacific Coast Section, L. J. Fletcher, Secretary; Federal Board of Surveys and Maps, J. R. Haswell. A report on a revised agricultural engineering classification was made by E. G. McKibben, a member of the committee having that matter in charge; it was followed by formal action to the effect that the matter of decision on the classification be left to the Council with power to act.

An important subject presented for discussion at the business meeting was the proposed grouping of states so that the territory of the geographical sections now in existence and yet to be organized could be definitely defined. This matter however was not one that could be decided at a single meeting and a committete is being appointed to make a study of the problem and report at the next annual meeting.

At its meeting last December the Pacific Coast Section devoted considerable discussion to the field of the Society in reclamation. A committee of the Section later formulated a statement which it proposed for adoption as the definite policy of the Society. This statement of proposed policy appeared on page 188 of the May, 1926, issue of AGRICULTURAL ENGINEERING. At the annual business meeting Major O. V. P. Stout presented the matter for adoption as the definite policy of the Society. Formal action was taken by the Society definitely committing the Society to the policy recommended. In taking this action it should be understood that this policy applies only to the Society as an organization representing the agricultural engineering profession and not to individual members who are free to enter any field they see fit without necessarily losing their identity as agricultural engineers.

Considerable discussion was devoted to the study of waste in agriculture which American Engineering Council has requested the Society to undertake.

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This fact is proved by the extensive use of New Departures over a period of years by those manufacturers of farm machinery who have the facilities to make extensive research and tests. And invariably these Ball Bearings are used in such important and out-of-the-way positions as crank shafts, transmissions, etc.

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The inspection trips following the annual meeting were a source of real inspiration and intense interest to all who took them. The party left Tahoe Tavern, Monday, June 28, and spent the day inspecting the hydroelectric developments in the Sierra Nevadas; this trip was made possible through the courtesy of the Pacific Gas and Electric Company and the Auburn Chamber of Commerce. The second day was devoted to inspecting the agricultural developments and engineering features of the lower Sacramento Valley, which included a stop at the University Farm at Davis. The third day was spent in visiting the Sacramento-SanJoaquin Delta, and the fourth day rural electrification, irrigation, drainage, and agriculture of the lower San Joaquin Valley.

Resolutions Adopted at the 20th Annual Meeting

The following are the resolutions which were adopted by the American Society of Agricultural Engineers assembled at its 20th annual meeting:

WHEREAS the 20th annual meeting of the American Society of Agricultural Engineers is now in session at Tahoe Tavern, Lake Tahoe, California, and the meeting is being made so enjoyable and helpful to members and guests through the thoughtfulness and untiring efforts of the Pacific Coast Section of the Society, therefore,

BE IT RESOLVED that the Society extend its appreciation and thanks to the Pacific Coast Section for the splendid arrangements and entertainments which have contributed so much to the success and enjoyment of the meeting.

WHEREAS the American Society of Agricultural Engineers at its 20th annual meeting has greatly enjoyed its sojourn at Tahoe Tavern, therefore,

BE IT RESOLVED that the Society express its thanks and appreciation to the management for its generous service and hospitality.

WHEREAS the Pacific Coast Section of the American Society of Agricultural Engineers has provided for four days of field inspection for members and guests of the Society following the 20th annual meeting, and

WHEREAS these inspection trips have been made possible through the generous cooperation of public utilities companies, land companies, trade associations, other organizations, and citizens of California, therefore,

BE IT RESOLVED that the Society express its sincere thanks and appreciation to all assisting in making these instructive trips possible, and

BE IT FURTHER RESOLVED that the secretary of the Society be instructed to send copies of this resolution to each organization or individual contributing directly to these trips.

WHEREAS the success of the program of the 20th annual meeting of the American Society of Agricultural Engineers has been made possible by the many excellent technical papers and addresses presentd at the various sessions, therefore,

BE IT RESOLVED that the secretary of the Society be instructed to send letters of appreciation and thanks to the various speakers for their splendid contributions to the program.

WHEREAS the American Society of Agricultural Engineers is vitally interested in the progress and advancement of the agricultural industry, therefore,

BE IT RESOLVED that the Society pledge its full support to American Engineering Council in its proposed study of waste in agriculture and to other organizations interested in similar studies of interest to the agricultural industry.

WHEREAS the U. S. Department of Agriculture through its division of agricultural engineering of the Bureau of Public Roads is conducting a survey of research in mechanical farm equipment in general accordance with suggestions outlined by the American Society of Agricultural Engineers and the National Association of Farm Equipment Manufacturers, therefore,

BE IT RESOLVED that the Society express to the honorable, the Secretary of Agriculture its appreciation of the fine progress already made on this project and pledge our continued and unqualified support in a continuation of this study.

Employment Bulletin

This service, conducted by the American Society of Agricultural Engineers, appears regularly in each issue of Agricultural Engineering. Members of the Society in good standing will be listed in the published notices of the "Men Available" section. Non-members as well as members, are privileged to use the "Positions Available" section. Copy for notices should be in the Secretary's hands by the 20th of the month preceding date of issue. The form of notice should be such that the initial words indicate the classification. No charge will be made for this service.

Men Available

AGRICULTURAL ENGINEER, married, age 29, 1922 graduate of Iowa State College in agricultural engineering, now assistant engineer in construction department of International Railways of Central America, desires position where permanent residence is possible, preferably experimental or production work, or management of reclamation project or large ranch. Ten years experience in general farming with power equipment, experimental and teaching work, and construction work. Can speak Spanish, also some French and German. MA-130.

AGRICULTURAL ENGINEER, graduate of Cornell University with advanced degree in agricultural engineering, desires position designing and developing farm machinery and equipment, or doing agricultural engineering research. Experienced in the design of several types of machines and of wooden and reinforced concrete structures. Has demonstrated exceptional inventive ability. Several years instructor and assistant professor in agricultural schools and colleges. MA-131

WORKS MANAGER available. Seventeen years experience in the designing and manufacture of tractors, harvesting machines, and earth-working tools. Sales experience in United States, Canada, England, France, and Italy. Write for interview. MA-132.

AGRICULTURAL ENGINEER, graduate of University of Illinois, nine years teaching experience as assistant professor in one of the largest universities of the central west. Eleven years manufacturing experience with one of the large tractor and farm implement builders. Experienced in production, design, and management. Desires position preferably as extension agricultural engineer or experimental or production manager work. MA-133.

AGRICULTURAL ENGINEER, single, age 26, graduate of University of Nebraska, College of Agriculture, with two years' practical experience in advertising and sales work, would like position in similar work preferably in South or Central America. Very good at drafting, designing, and photography of farm implements. Can speak a little Spanish. Has had a few articles published. Would submit samples of work. MA-134.

AGRICULTURAL ENGINEER, 1917 graduate Iowa State College, ten years experience in highway; city; drainage; irrigation; concrete products; and concrete construction work. Available for immediate employment. MA-135.

Positions Open

SALES ENGINEERS WANTED: One of the largest bearing manufacturers in America can use the services of two good sales engineers. Men with an engineering education and sales experience in farm tractor and implement field are preferred. They should have designing ability so that they can be of service to customers. Those experienced in the farm-implement and tractor design will be shown preference. Write fully giving all data as to experience, education and salary expected.

RESEARCH STUDENT in agricultural engineering wanted. He will receive fifty dollars a month and will be allowed to do half-time graudate work during this time. Half of this time will be taken up with the experiment station projects now under way. A graduate agricultural engineer preferred. Send application to J. C. Wooley, Agricultural Engineering Department, University of Missouri, Columbia.

AGRICULTURAL ENGINEER wanted to take charge of rural electrification project. Position to be filled at once. Send application to J. C. Wooley, Agricultural Engineering Department, University of Missouri, Columbia.

AGRICULTURAL ENGINEER wanted to fill position at Preston, Cuba. Knowledge of Spanish desirable but not absolutely necessary. Farm experience, knowledge of gas and steam engines, and such machinery as ordinarily used on large sized farms is essential. Salary $150.00 to $175.00 per month, according to experience. Single man preferred. PO-116.

WANTED young man, preferably with agricultural college training, to manage small truck farm. Probably some research work. Apply stating age, education, experience, and salary desired. Office personnel division, 260 South Broad Street, Philadelphia, Pennsylvania.